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Industrial Russia Today

Communism on the Wane—Government Losing Hold on People Through Failure of Golden Promises—Factories Being Returned to Private Enterprise

By OUR LATVIAN CORRESPONDENT

READERS who are connected with the machine tool trade will be interested in the future of industrial Russia. There are those who wish to sell their products—if the conditions will permit—to Russia, and they should get acquainted with the Russian industries in their particular line; and again, there are many who would desire—when the proper time arrives—to open their works in Russia—as it was done by foreigners in the pre-war times—using the cheap labor and immediate market. But before one enters into a discussion of future prospects, it is desirable, even necessary, to survey briefly the principal causes which have brought about and aggravated the present deplorable state of the industry of Russia.

Russian Industry Never Strong

Much has been said and written of late about the wrecked industry of Russia, and an opinion has now become established that the sole cause-abettor is the Bolshevist régime. No doubt the Bolsheviki with their absurd experiments and radical doctrines have weakened the industry to such a degree, that a lengthy period must elapse before the regular working can be re-established, but when we look a little deeper, we find that the Russian industry was never strong and that, on the whole, it existed chiefly on the protective custom tariff. The proof of this statement will be found if we look back to pre-war times and examine the records of industrial Russia. The Russian statistics leave much to be desired and it may seem a little strange that the most comprehensive figures about Russian industry are found in the records of the year 1908, when the general industrial census was taken. In later years only the more important industries were registered and tabulated.

In December, 1912, Russia had about 160,000 manufacturing establishments which gave employment during the year to an average of 3,100,000 operatives. Let us put aside 130,000 of these establishments as being insignificant (with only 168,700 operatives); only 29,965 with 2,931,300 operatives were investigated and tabulated. The establishments that were investigated turned out, during 1912, products to the value of $2,926,380,000 or about $1,000 on each operative.

About 25 per cent of all operatives were women and children, the earnings for all operatives being from $60 to $300 per annum. The output was low, owing to the scarcity of machinery, deficient operatives and very primitive management. Among executives 6.9 per cent were foreigners, and of the rest 88 per cent were without any technical education. The motive power was represented mostly by steam engines.

The industry of Russia was created—beginning from Peter the Great—by means of the protection of a very high tariff upon all importations of manufactured products. In the very beginning and up to the war, most of the better works were in the hands of Russian nobility, princes and even the Tsar. It certainly follows that the bureaucratic government of Russia then supported the domestic industry in every possible way.

Much could be said about the advantages or disadvantages of the protection system, but as for Russia, it can be stated without exaggeration, that on the whole, this system caused more harm than benefit. The population overpaid annually about 200 million dollars in the form of custom duties for imported manufactured goods; was obliged to satisfy its own needs with the inferior domestic manufactures, and even the wages in some industries were lower than on the farms. And last of all, the protection system managed the industry carelessly and there was no urgent need of improvement and modernization in the factories.

A great part of the Russian factories leaned upon the government's orders, being paid on a cost-plus-profit basis, without considering the foreign prices for similar products. Being protected by the import tariff and government's orders, the industry was not pressed to introduce improved methods of manufacture which would reduce hand labor to the minimum. Hand labor prevailed, the engine motive-power being comparatively low, only 0.92 hp. per operative, in average, for all branches of industry.

All the foregoing considerations lead to the conclusion, that being artificially cultivated and supported by the government the industry of Russia had enough to keep it content, without using much effort in strengthening its own efficiency.

Handicaps of Russian Industry

It would be unjust to deny that the industry of Russia was handicapped by some factors, the more important of which was the lack of industrial credit. For various reasons banking in Russia has been rather backward. In 1914 there were only forty-two commercial banks in Russia with 601 branch-offices, one for every 250,000 of the population. The paid up capital of these banks amounted to $399,800,000, only few banks being big.

It follows then, that having so little capital in a territory with 180 million inhabitants, these commercial banks were not particularly inclined to open long-termed industrial credits, which was necessary for better equipment, improved machinery and new buildings. The main activity of the Russian commercial banks was the discounting of bills and advancing short-termed loans on various securities. The interest rate was not low, being 8 to 10 per cent per annum. Besides the banks there were many small-credit, municipal and mutual credit banks, but their capital was smaller and

the interest rate was up to 12 per cent. As for the State Bank, it helped only the best and financially stronger enterprises.

The fact must not be overlooked that German capital had a controlling voice in the joint-stock commercial banks of Russia, and was not interested to develop the Russian industry, because Russia was regarded and used by Germany as the chief and best market for her products.

Having discussed the circumstances which affected the Russian industry in the period up to the great war, we come to the war- and communistic- period when the industry experienced many radical changes, which should be traced in order to forecast, to a certain degree, the future of industrial Russia.

The Help of the Great War

The great war, not being fought on the soil of Russia but on territory occupied by the present Poland, Latvia and Lithuania, did not disturb Russian industry, but rather strengthened it. The existing plants were expanded, new ones were erected and small workshops were provided with mechanical equipment. As the war continued, Russia began to feel her dependency on imported foreign products, chiefly of German origin, and so new industries were created and developed—dyes, medicaments, explosives and various chemical products, surgical instruments, optical glasses, agricultural machinery, electrical goods, automobiles and aeroplanes in particular. Under favoring circumstances the growth of the industry continued until it was retarded by the revolution in 1917.

Since March 1917, thanks to revolution, labor has begun to dominate the political and economical life of Russia. Labor began to dictate to the government how it should conduct the business of the state. Everywhere labor began to demand increased wages, not only for the future, but for the past. All those demands, being sanctioned by the new government, were satisfied. On the urgent representations of the workmen the eight-hour day was introduced (April 1917), and the compensation for over-time work was increased 150 per cent above the normal.

In July of this year the manufacturers, frightened by the still increasing demands of labor, began to shut down their plants and in the autumn there were many unemployed, who not being able to find work, returned to the farms.

Russian Industry's Greatest Blow

The most serious blow that the Russian industry has had to withstand, was the control of labor introduced on Oct. 29, when the Bolsheviki seized the power. By a decree of Nov. 14 the factory committees were established. The task they had to perform was to introduce and to maintain order in factories, but in reality they turned their activities to further demands of increased wages, regardless of the actual earnings of the enterprises.

The decree of Nov. 19 directed all manufacturers to insure their laborers against unemployment. They had to deposit in a special "cassa" a premium equal to from 3 to 6 per cent of the wage of the laborer. In case of unemployment the laborer was to receive a full day's pay, together with the usual allowances for lodging, etc.

By a decree of Dec. 16 all banks were nationalized and united in one, called the National Bank, which replaced the State Bank. With that the manufacturers lost the chance to obtain the necessary credit. The new National Bank furnished credit only on recommendation of the factory committees, and it was not always easy to attain an understanding between the manufacturer and the committee. Being deprived of the necessary credit, the manufacturers arrived at a critical stage, and one by one were obliged to suspend their activities.

At the same time the communistic government began to nationalize and confiscate the factories and workshops, the management being handed over to the factory committees. Usually, the confiscation was effected by the request of the committees, who wished to become the managing power.

So disastrous were the effects of these conditions that by April, 1918, the industries in Petrograd employed only 144,530 hands, instead of 365,777 in 1917. The numbers of the unemployed became dangerous and free passage was introduced on all railroads to enable the unemployed to return to the farms, or even emigrate to Siberia, where food was yet abundant. Hence the disappearance of the industrial worker.

Nevertheless the nationalization of the industries was continued (although not until the end of 1920 were the more important establishments united under the government's management), and more radical changes were introduced. All piece work was abolished and the factory committees recognized only the flat rate, thus reducing the difference between the skilled and unskilled, and making the incentive to qualify for the more responsible job much less. An enormous decline in output followed.

The Influence of Hunger

Another factor of almost equal importance commenced to exercise its influence on the crippled industry—hunger. The grain crop of 1917 was 18 per cent below normal, mostly because the big estates of the "pomieschiki" (who possessed about 50 per cent of the whole private land in Russia) were seized by peasants and only part of the land sowed. This bad crop created a scarcity of food in cities, and industrial workers, accustomed to a good supply of food, were obliged to exist and work on almost nothing. The result was a rush of workers to the farms. The emigration to the farm is continued today and according to the census of 1920, the big cities lost three and a half million inhabitants since 1917.

As the result of all this, the productivity of the industry decreased well-nigh to naught. Stores being empty, commerce gradually suspended its activities and small speculants prevailed. Obtaining nothing from cities and industry, the farmer ceased to bring his products to the city and as early as the spring of 1918, the food was forcibly collected from the farms by soldiers. To stimulate this collecting the soldiers of the Red army were allowed to retain, as their reward 15 per cent of the collected foods. Notwithstanding that, it was impossible to collect more than 45 per cent of the fixed amount. There was now the alternative: Factories were abandoned by workers, because the farmers did not supply them with food; but the farmers withheld the food from the cities because neither the cities nor the factories were able to return in exchange the necessary implements and commodities.

The Letts and Poles were at war with the Bolsheviki and the Soviet government was forced to keep the Red army—and feed it. The food was to be obtained

from farmers, mostly in exchange for manufactured products (the valueless paper money was accepted very unwillingly) and consequently, the government was obliged to maintain the existence of the industry and to raise the productivity of it. Besides that, there was a shortage of workers and it was necessary to draw more of them to the factories.

Extreme measures were adopted. In order to raise the productivity the flat rate was not abolished, but the daily ration of food, which was given to the worker in exchange for his work, was raised—if the worker prolonged his day over eight hours. The common ration contained one pound of bread daily for eight hours' work, but for ten hours' it was raised to one pound and a quarter, and to one pound and a half for twelve hours' work. It would seem strange that such a trifle as one quarter of a pound of bread was able to stimulate the worker to prolong his working day two or even four hours longer, but in reality it was so.

At the same time the factory committees were abolished because they did not justify the hopes of the Bolshevist leaders. These committees were formed to maintain order and discipline in the factories but they lost the last remnants of discipline, and even plundered the factories themselves.

By a decree of Jan. 1, 1920, all industrial establishments became militarized, all factory committees abolished and the management handed to individual directors who had unrestricted power, including the right to deprive the worker of his daily ration and to exile him to a punishment camp. It has been said that in March, 1920, these camps contained 240,000 exiled workers.

Taylor System Adopted

The factories being militarized, the discipline grew strong, delays and walk-outs were not allowed. The government began to interest itself in the Taylor system and formed advisory committees composed of representatives of the former leaders of industry. As a result the Taylor system was adopted and applied. Doubtless, the results of the trials were insignificant owing to the hunger, low pay and iron discipline; at least, the Bolshevist press does not mention the system.

By Jan. 1, 1920, of Petrograd's 740 important factories only 434 were open, and only 171 of 681 in Moscow were going. Notwithstanding the militarization and the efforts of the government, production did not increase; in fact it almost stopped when in the spring of 1920, owing to the lack of fuel and wrecked transportation, 75 per cent of the operating factories became idle.

Former Owners Invited

Finally the government became annoyed by the nationalized industry and various projects were invented to save the situation. It was resolved to unite the better factories in trusts, for better management, and to lease the smaller ones to co-operatives or even to private manufacturers. In connection with this it was necessary to restore the rights of private property and the personal rights of private manufacturers. It was accomplished by several decrees and thus, the retreat toward the old capitalistic régime was commenced. The Soviet government by this recognized that the nationalization of industry was a failure.

Offering the wrecked industrial establishments for lease, the Soviet leaders expected there would be a rush of private persons, but their hopes were not justified. By Nov. 1, 1921, only 4,200 enterprises were taken on lease. Among them were 2,400 grain mills, over 1,000 oil mills, 145 tanneries, 55 wood-working mills, and 20 brick works. These enterprises are all of small description, employing a small number of hands each. As for the terms, 499 leases were granted up to six years, some to fifteen years, but the majority from 2 to 3 years. In 1,266 cases the leases were given to private persons (sixty of them were the former owners), in 500 to co-operatives and in twenty-five cases to municipalities. It is worth while to note, that all the leased enterprises are connected with farms and, consequently, they will not be affected by the irregularities of the wrecked transport. They will work only for their immediate market.

From the viewpoint of the foreigner these leases can be used as feelers for the much advertised concessions. If only the small rural industrial establishments are taken on lease, but not the more important urban workshops and factories, there must be deep and serious reasons.

Trusts, Combines

According to the statistics of the Third Internationale, there are 550,000 communists in Russia (among 130 million inhabitants). No doubt this figure is greatly exaggerated. People declared themselves communists in the very beginning of the revolution when there were bright hopes in the future of the communistic state. A great many of them were only "opportunity-communists," desiring to acquire some privilege—to become commissaries. Two years ago Lenin said: "There are in Russia only three real communists —I, Lenin and Ulyanoff (his former pen-name)." The former commissaries and all more or less important communistic officials acquired some fortune and they are representing the "new bourgeousie" of Russia. They do not wish to mix with the common laborers, the word "camrade" is used very sparingly and they are lost for communism. The sole support of the communistic government should be the industrial worker, who has nothing to choose, nothing to lose; but the industrial workers compose only 0.8 per cent of the whole population.

Returning recently to capitalism, the Bolshevist leaders openly declared that labor in Russia will be strong so long as the big industries remain in the hands of labor. Hence the forming of trusts and combines. The Soviet government is trying to keep the country under its control by concentrating the basic industries under its management. That is called the "capitalism of State." The idea is not bad, the question being how long government will be able to manage the industries. If the experience of the world is anything, the government's management will be always handicapped by lack of private initiative. Anyway, the Soviet government is convinced that the course taken is the best one, and is endeavoring to strengthen the industrial trusts or, as they are called, combines.

Collective Pay System

It is worth while to note the collective pay system introduced by the Soviet government to raise the productivity of the individual worker. The main feature of this system lies in the collective responsibility of the employees of a certain enterprise which is more than the well-known sharing in profits. The minimum output of an enterprise is fixed by the government in advance.

Likewise, the budget of the enterprise and compensation for work is fixed. If the personnel of the enterprise, conjointly, will discharge the less efficient members and will produce the fixed output, the fixed amount of pay, as compensation for the work, goes in full to the remaining personnel and is distributed according to the efficiency of each individual operative. Thus, the operatives are interested to reach the fixed amount. Further, if the output is higher than the fixed amount, an additional adequate compensation will be allowed.

So much for the theory; as for the results, they are good, if the Bolshevist reports are true, the productivity being raised 10 to 15 per cent. In theory the private initiative of the individual operative is stimulated and improved; the question is how justly will the output be fixed by the government. There are many reports that the Soviet government is not able at present to deliver to its industrial enterprises the promised money, food and other products, and this fact, undoubtedly, will check the good will and efforts of the employees.

It appears from what has been said, that American capital and American enterprise should be more interested to exploit the potential possibilities of Russia in the immediate future, than to allow the country to be overrun by others.

The Automobile Outlook for 1922

By Alfred Reeves
General Manager, National Automobile Chamber of Commerce

The close of the year 1921 found the automobile industry of the country in a better condition than was anticipated. Production for the year was 1,690,000 motor-driven vehicles, of which 145,000 were motor trucks. This is approximately 24 per cent less than the number of motor vehicles built in 1920, the average value, however, being about 35 per cent under that year. A very considerable saving to the public is indicated owing to the lowered prices.

It must be remembered that the automobile industry was among the first to lower prices and to liquidate its inventory of high-priced materials and to give buyers the saving to be effected in the future by lowered replacement costs. The industry also took care of its 33,000 dealers, paid off its loans, and has handled a business of approximately $2,000,000,000.

In spite of the criticism as to the cost of large display advertising space in high priced publications, the advertising cost of the industry as a whole is in the neighborhood of 2¼ per cent, the lowest known percentage of any large industry, being but little over half the amount expended by the collar manufacturers and less than half that used in calling attention to California.

It has been pointed out in many quarters that there are too many kinds of automobiles being built at the present time. This has been a feature of the development of every manufacturing industry in this country, and there is little doubt that we shall see elimination in certain grades of cars where there is extreme duplication at the present time. It must, however, be remembered that the motor car, probably more than anything else, is a family affair and that it must be considered from more different angles than almost anything else. Details, which may not affect the actual service to be obtained if the car is considered solely as a method of transportation, have a marked effect on the satisfaction and favor of the different members of the family. Then there is a psychological effect of the car as some sort of a criterion of a man's social or financial standing, which is bound to have its effects for many years to come.

One feature which stands out pre-eminently among the automobile builders who are members of the National Automobile Chamber of Commerce, is the system of cross-licensing as to the use of patents taken out by members of the body. This eliminates expensive and annoying litigation and gives each manufacturer an opportunity to use the latest development of the industry as a whole. This distinct benefit to the users of automobiles has done much to promote the development of practical improvement in automobiles generally.

As an alternative to this cross-licensing, any member of the N. A. C. C. can withhold his patent for his own use, but if he does so, he must then pay a royalty on any patent which he uses, after arranging with the party who controls the patent. An arrangement of this kind, in such lines as the machine tool industry, would greatly facilitate the manufacture of highly productive machine tools and would be of great benefit not only to the machine tool builder, but to the user as well.

Prophecies are always dangerous. Those who have carefully studied the situation are looking forward to 1922 with confidence. While it is quite possible that the total number of cars built may not greatly exceed the output for 1921, the liquidation which has taken place, the evident desire on the part of nearly every automobile builder to make prices that will give the utmost possible value to the customer, points to a renewed era of good feeling between builder and user. Then too, the growing appreciation of the need and value of service will be of distinct benefit to the industry as a whole. Any increase in business generally can hardly fail to be reflected in the automobile industry, as the motor vehicle has become such a necessity in our every-day life that we will do without many other things rather than give up the conveniences due to its use.

Automotive Service Methods and Equipment

VII. Tools Used for Servicing Hudson and Essex Cars—Fixtures For Testing and Straightening—Attachments for Lapping Pistons and Cylinders

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

THE service equipment of the Hudson Motor Car Co., of New York, includes a number of excellent tools, both as regards efficiency and simplicity of operation. Fig. 1 shows a valve grinding machine which is so light that it can easily be lifted by one man, and occupies but little space on a bench. The machine

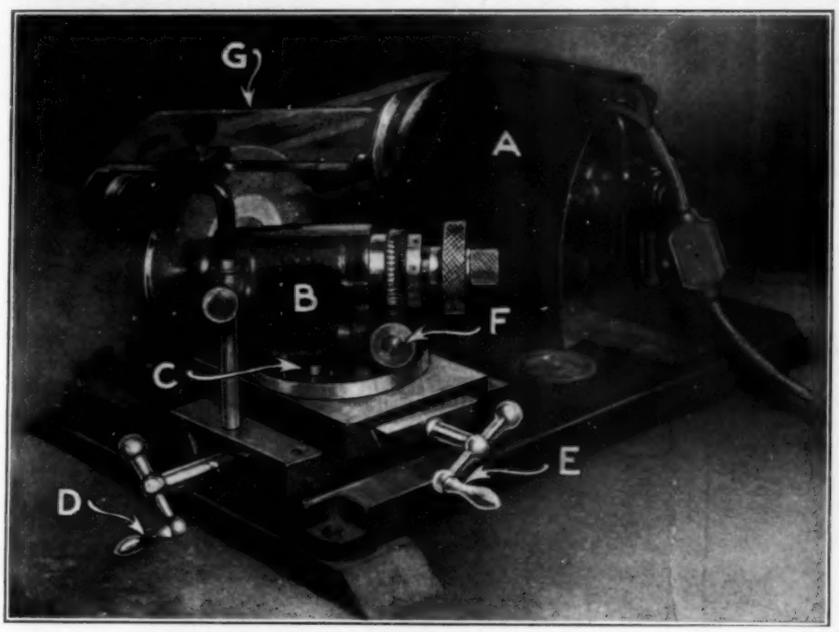


FIG. 1. BENCH VALVE-GRINDING MACHINE

is made by the Franklin Machine Tool Co., Springfield, Mass. The machine is motor-driven, the motor being back of the guard *A*. This guard is to prevent flying particles from lodging in the mechanism of the motor. The part *B*, which contains the spindle in which the valve is held, can be swung to any desired angle and locked in that position by means of the locking screw *C*. The handle *D* feeds the work to the wheel and the handle *E* controls the traverse. The spindle is driven by a wormwheel and gear, the worm being connected to the end of a flexible shaft which can be seen at *F*. On the opposite end of this shaft is a pulley which is driven by belt from the motor. The wheel runs at a speed of 4,500 r.p.m., and the valve rotates at a speed of 43 r.p.m. A guard made of heavy plate glass is held over the wheel at *G*. This protects the operator's eyes from flying particles, while giving him the opportunity of watching the operation of the work.

The method of straightening connecting rods, shown in Fig. 2, is very efficient, considering the simplicity of the apparatus. An angle plate *A* has been bored and tapped on one side for the plug *B*, which holds the large end of the connecting rod. This plate is bolted to the cross-slide of an engine lathe. A rod ground to the size of a wristpin, and tapered to a point at either end is inserted in the small end of the rod as shown at *C*. As the angle plate is perfectly square with the lathe centers, if the rod is straight the ends of the pointed rod should touch the points of the centers. Rods that are bent or twisted are straightened with a claw-bar as shown.

Figs. 3, 4 and 5 illustrate the working of another tool for testing the straightness of connecting rods. The pin *A*, on which the large end of the rod is held, is square with the surface *B*. A wristpin is put into the small end of the rod and the rod is tested for straightness in both planes by using a small angle plate *C*. The method of holding this plate is best illustrated in Fig. 4. The face of one angle, which is flat, rests against the faceplate *B*. The other angle is made with two square legs or projections so that the end of the rod will be cleared, as shown in Fig. 4. A spring-pin *D* is made with a ball on the end, which locates in a seat in the back of the angle and, while allowing free play, holds it tight against the faceplate. In Fig. 4 the angle is set for testing the rod for straightness in one plane; in Fig. 3 the angle is swung around for testing the straightness in the other plane. In Fig. 5 the angle is raised and turned with the legs toward the reader. A clearance slot is milled in the side of the angle so that the rod can be tested for off-set. Thus the rod can be tested for straightness for twist, and for off-set in a few seconds and without the use of extra tools. The rod can be straightened while on the fixture with the use of a claw-bar.

The fixture shown in Fig. 6 is for testing the

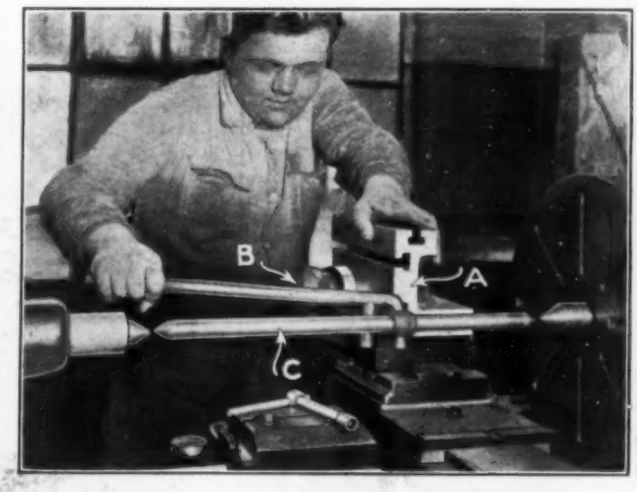
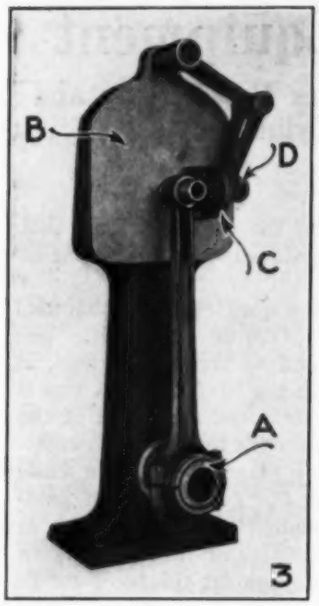
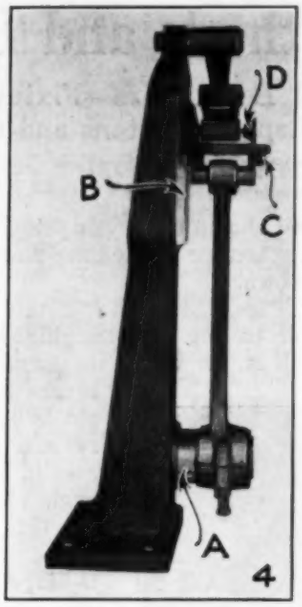


FIG. 2. STRAIGHTENING CONNECTING RODS

straightness of pistons after they have been assembled to the motor. The connecting rod has just enough side play on the wristpin so that the piston should touch





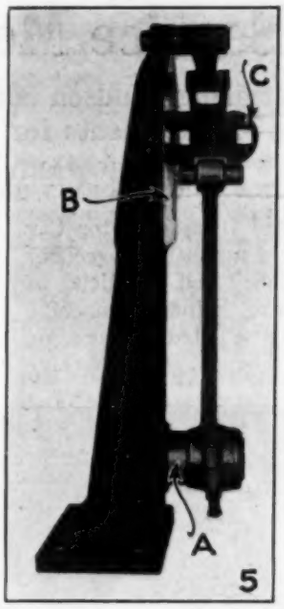


FIG. 3. TESTING CONNECTING RODS FOR TWIST. FIG. 4. TESTING CONNECTING RODS FOR STRAIGHTNESS. FIG. 5. TESTING CONNECTING RODS FOR OFF-SET

both the outer bar *A* and the inner bar *B*. This assures that the piston will have play enough so that it can center itself properly in the cylinder. If the rod is perfectly straight, the side of the piston will be parallel with the rods. The tool is located by the studs in the crankcase, and is light enough so that it can be handled easily.

A unique device for testing the roundness of piston rings is illustrated in Figs. 7, 8 and 9. It consists of a hardwood box containing an electric light. A counter-bored ring *A* is set into the upper surface of the box at a convenient angle for the operator. The plate *B* fits into the ring *A*, being placed so that the slot *C* is at the bottom. The plate *D* is now placed over plate *B*. The inner edge on plate *D* comes just half-way over the slot *C*, letting the light shine through one side of the slot. The piston ring to be tested is now placed in the hole in plate *D*. The ring is of sufficient thickness to cover the exposed half of the slot so that no light will shine through unless the outer circumference of the ring is defective. By rotating the ring, any flat or uneven spots on the ring can be seen instantly as an aperture of 0.001 in. or even less can be very easily seen against a strong light. The spot where the rings have been rotated can be seen on plate *B*. All light from outside sources is excluded by the use of a tube *E* similar to that on a fluoroscope. The tube can be raised for the insertion and removal of the rings.

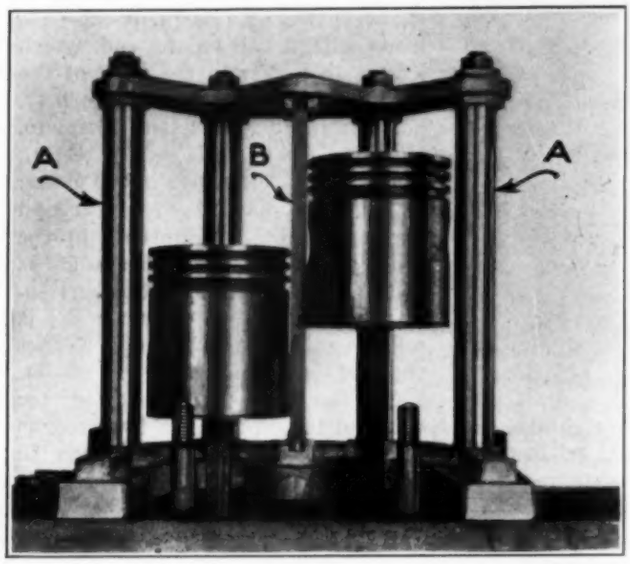
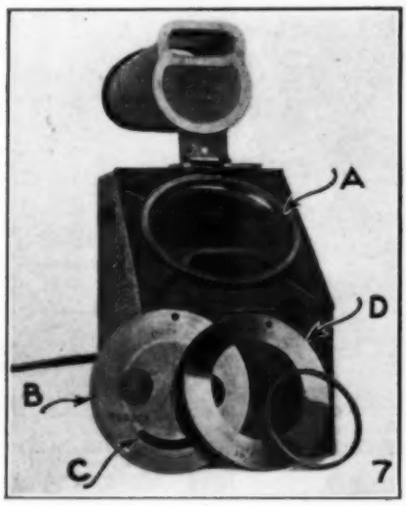


FIG. 6. FIXTURE FOR TESTING STRAIGHTNESS OF PISTONS AFTER ASSEMBLING

An attachment for lapping cylinder bores is illustrated in Fig. 10. This tool consists of a spindle *A*, the top and bottom collars *B* and *C*, the cones *D* and *E*, the spring *F*, and the three sections *G*. A slot *H* in the bottom of each of the three sections engages a corresponding projection on the collar *C*, which prevents the sections from slipping as the tool rotates. The action of the spring *F* tends to draw the cones *D* and *E*



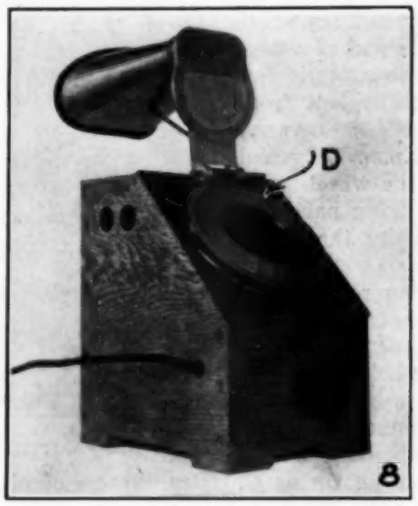


FIG. 7. DEVICE FOR INSPECTING ROUNDNESS OF PISTON RINGS. FIG. 8. FIXTURE WITH PLATES AND RING IN PLACE. FIG. 9. DEVICE IN POSITION FOR OPERATION

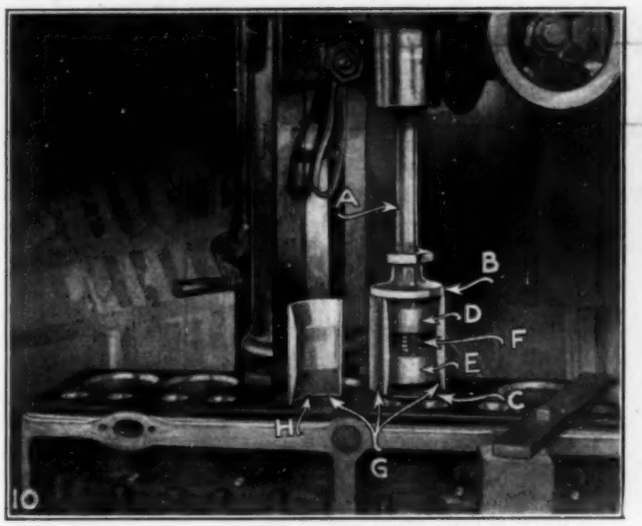


FIG. 10. CYLINDER-LAPPING ATTACHMENT.

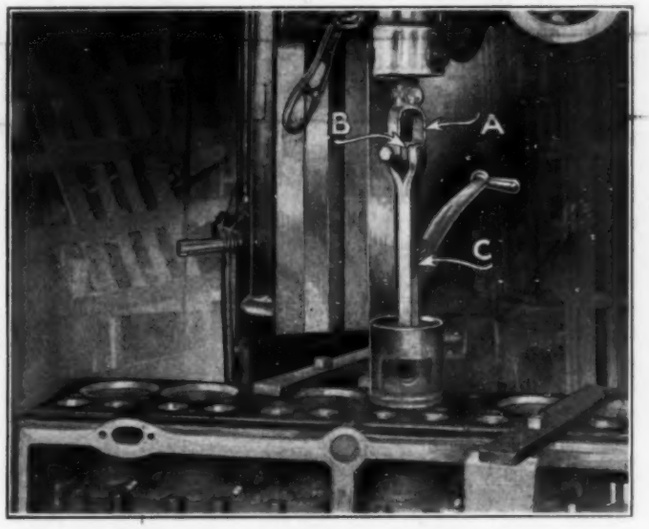


FIG. 11. DEVICE FOR LAPPING PISTONS

together, so that they have to be forced apart with the hand in order to place the sections *G* in position. Once in, they are held by hand until inserted into the cylinder bore, when the action of the spring holds them against the wall. The collars and cones are made of steel and the sections *G* are made of cast iron with a thickness of sheet copper riveted to the outside. A shoulder is cut in the ends of the sections into which the edge of the collars fit. Thus the sections project beyond the edges of the collars, which insures that only the copper will touch the cylinder wall.

A mixture of oil and carborundum is used for the lapping process, No. 60 carborundum being used at the start and No. 180 for finishing. From 0.010 to 0.015 in. can be removed with this tool in approximately 15 minutes.

Lapping in the Pistons

After the cylinders have been lapped to size, pistons are selected which will be a "push" fit in the bores. Then the pistons are lapped in, using the attachment shown in Fig. 11. The yoke *A* is forged with a spindle which is turned taper so that it can be inserted into a drilling machine spindle. The arm *C* is attached to the piece *A* by means of the block *B*. One yoke is held to the block by means of a bolt which goes through both block and yoke-arms, while the arms of the other yoke are held to the block by means of short screws. The lower end of the piece *C* is made with a hole through it similar to a piston-pin hole. A wooden piston-pin is used to hold the piston to the piece *C*; thus if the pin works to one side of the cylinder, the cylinder walls cannot be injured. The pistons are lapped to a size 0.0025 to 0.003 in. smaller than the bore of the cylinder, using a mixture of oil and ground glass for the process.

Old Times in the Hartford Shops

By A. J. Strong

The article on page 849, Vol. 54, of the *American Machinist*, by E. A. Dixie, on the use of paper in the machine shop, interested me and brought to mind some of my shop experiences of former days which may also be of interest to some of your readers.

The virtues of paper used in the manner described so thoroughly by Mr. Dixie were well known to the ancients, for when I was an apprentice with the Pratt & Whitney Co., in 1881 and 82, all time cards, which were about the size and thickness of a playing card, were saved by the time-keeping office, tied up in bundles, and placed in the various toolcribs where they were considered as essential to the equipment as waste, file handles, emery cloth and other supplies. Each workman kept himself supplied with these cards, and they were used extensively in the various ways described by Mr. Dixie.

After some years spent as a roving mechanic, which included a period with the Elgin Watch Co., I returned to the Pratt & Whitney Co. and worked on models and gages, making personally all of the model breech block mechanism for the one, three, and six-pound Hotchkiss guns. The time cards were still very much in evidence, and they were of far more value on the finer class of work than in the machine departments. They were handy to figure on and would prevent a strap or clamp from bruising the work in a way which was pleasing.

My bench vise had smooth jaws but they were seldom without a couple of these cards folded in the middle as false jaws, and each jaw was fitted with a flat spring about 3 in. long, one end being riveted to the soft part of the body, and extending up to the top, the cards being slipped under the springs to hold them in place. This prevents the work from coming in contact with the hard jaws of the vise and being bruised and dented, and in addition the grip is much more secure for the reasons explained by Mr. Dixie.

Mr. Dixie mentions the late Mr. Smith, whose reputation as a planer hand has been carried all over the country by men who have worked for the Sigourney Tool Co. At the time I worked there they were building some automatic machines for making brass-head upholstering tacks, for a concern down Waterbury way. A new man who had been hired to do the fitting and assembling took a cast-iron gib or strap to Charlie Smith and complained that it was sprung, suggesting that he plane it over. Charlie put it down on the table of his planer, tapped it gently with a piece of babbitt, and the tell-tale rattle proved that it was as represented. He then made a remark which we will omit, and slammed the piece of work down on the floor, appearing very much put out, which you will understand was disconcerting to the man who was making the complaint about his

work. He then picked the piece up, carefully tested it again on the planer table, and as it was perfectly straight handed it back saying "there you are my friend." It is needless to say that another man right then concluded that Charlie Smith was " some planer hand."

He knew cast iron from every angle, and could tell from looking over a casting just what it would do under certain conditions, and, like Ty Cobb, he could outguess it and turn its eccentricities to his advantage. In spite of Charlie's knowledge of the planing game we "got his goat" one day by springing on him the problem of planing a square taper bar against an angle plate. After giving the problem a little thought he allowed that if he had a square angle plate he could plane anything square against it and there was no occasion for argument. To further prove how he felt about it he offered to bet his farm on the proposition; he did not care to have tenderfeet argue with him on planer problems. All planer hands who can do the above may hold up their right hands.

In those days Charlie drove in from his farm with his horse and carriage, and stabled them in a barn adjoining the factory. Dave Weir who was a David Harum toolmaker drove to work also and stabled his horse in the same barn; it was worth while to hear them discuss their horses at noon after lunch.

I rode to work on a full nickel expert 52-in. Columbia high bicycle which stood under a shed during the day. This was at the time when the Stiles & Parker press plant at Middletown burned and some of their men came to the Sigourney to work. One of them told me if Mr. Stiles should see one of his men ride to work on a bicycle, he would cut down his pay; evidently he did not believe in his men living in a reckless manner.

It seems safe to assume that Mr. Stiles would not have been able to get much pleasure out of the manufacturing proposition in Detroit during the war, for the story was current of the toolmaker who secured a job and asked if there was a place to park his car. The employer seemed surprised at such a question and told him he was not wanted as they only employed toolmakers who had private chauffeurs to bring them to work and call for them at night.

The factory in those days was lighted by gas, and one of our stunts was to arrange two jets about four or five feet apart, light one and turn on the other without lighting, then cup the hands over the unlighted jet, filling the inverted cup with gas, swing them swiftly to the lighted jet, lighting the gas in the hands, and swing them back, lighting the second jet from the burning gas held in the hands. It is needless to say that this called for quick action. Another was to stand on some insulated material, hold the fingers of one hand close to a belt, and light the gas with the spark which would shoot from a finger of the other hand. It is probable that the later generation of mechanics who know nothing of gas lighting, have never had an opportunity to amuse themselves in this way.

In the days in question the principal business of the Sigourney Tool Co. was building the Smythe Book Sewing Machine. I was working with the engineer on development work, and the problem at the time seemed a serious one and was causing a lot of worry. The machine was perfected so that running straight ahead it worked in a very satisfactory manner, but if the operator happened to stop it and turn back the handwheel provided for control there was serious trouble. This was because a series of hooks which picked up the thread were provided with very light wire springs which shed the thread at the proper position, the tension of the thread being sufficient to hold the springs down until the proper position was reached, when the hooks were backed up slightly so the springs could release the thread. If the handwheel was reversed and the tension released before the proper position was reached, the threads were released at the wrong position.

One day there was an addition to our force, a man who wore a full beard and a pair of most kindly gray eyes. This was the late A. W. Jacobs, who had been making a wire stitching machine for books, in Worcester, and who had been bought out by the Smythe Co.

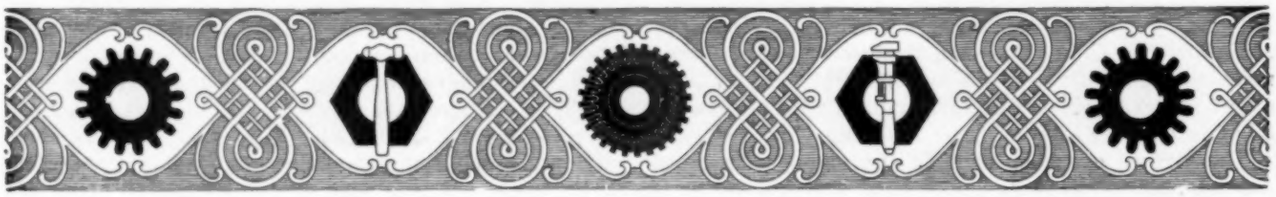
As soon as Mr. Jacobs saw the trouble which was occasioned by the spring hooks, he seemed to know just what to do to overcome it and he started a sample to demonstrate his idea.

He omitted the spring from the hook and in its place put a tongue on the order of a knitting machine hook, the tongue being pivoted about the middle on a pin. It was interesting to see A. W. make a drill of No. 70 drill rod to drill his holes. He then placed small pins in the stationary members of the machine, one for each hook, at a proper position so the tongue in the hook acted on it at the proper time, thus making the shedding of the thread positive at the desired point and preventing shedding at any other time, even if the machine were turned back and the thread slackened. This was long before he conceived his scheme of tightening a chuck with a gear instead of the spanner wrench which we used on the Almond chucks.

A. W. Jacobs was a born mechanic and a gentleman; a man whose friendship was well worth while. The phenomenal success he made of his chuck business indicates clearly the type of man he was.

C. D. Rice of the Underwood Typewriter Co., worked for the Sigourney Co. at that time. He made a vertical milling attachment on his own account to fit a Brown & Sharpe No. 2 universal milling machine, and I believe sold it to B. & S. It is my impression this was the start of vertical spindle milling attachments.

As I look back over the various shops I have been connected with, my impression is that the Sigourney Tool Co. did better work, and made less fuss about it than any other shop I have known. There seemed to be a strong feeling of pride in the organization, and a desire to excel. It was a good shop to work in.



Gear Tooth Shapes

A Study of Fundamentals in Principles of Involute Gearing in the Endeavor to Find a Suitable Standard Form and Pressure Angle

By E. W. MILLER
Chief Engineer, Fellows Gear Shaper Co.

PROBABLY there is no subject closely touching things mechanical concerning which there is a wider range of opinion, than gear tooth shapes. We have as heirlooms from another generation a number of erroneous notions which should be eliminated at the outset, thus doing away with the nonessential and that which tends to confuse and divert from the important factors.

It is believed none will contend for a tooth design other than involute, so that the involute system only will be considered.

The advantages of a recognized gear standard are apparent to those engaged in the manufacture of gears and those who make the various appliances for cutting the same. A standard means economy of production, uniformity of product, minimum equipment, and a definite knowledge of what is required. It also furnishes a definite basis for checking the product.

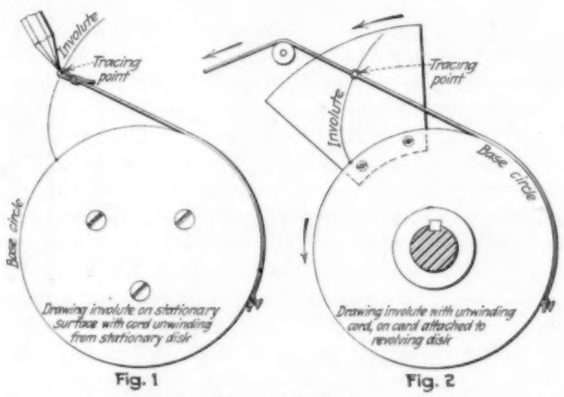


FIG. 1. DRAWING INVOLUTE CURVE. FIG. 2. TRACING CURVE ON CARD

A standard should be that tooth shape and that tooth proportion precisely defined by graphics, formula, or written words (and if necessary, all three) best suited to the great bulk of gear requirements. It is desirable for the sake of economy that, as far as feasible, such a standard shall accord with present-day practice. But present-day practice, economy or abstract theory should not interfere with the choice of a standard which broadly covers the field and at the same time assures a satisfactory product. As an absolutely perfect standard is obviously not attainable, the usual compromise is undoubtedly necessary. When a standard is finally adopted, its value would be much enhanced by a definite and carefully described system of inspection. Not only should the method of inspection be thoroughly worked out, but a system of inspection of the gear inspection devices should be carefully arranged. In this connection sets of limits should be established in strict accordance with quality required. The limit system should be set forth in plain, every-day language as free as possible from formulas, mathematics, and technical expressions. Not every man is, or can be, technically educated, and every effort should be made towards simplicity of procedure and clarity of description.

Let us think about an interchangeable system consisting of all toothed members from 12 teeth to a rack, inclusive, and in which each member of the system will run satisfactorily with any other member. The involute curve stands pre-eminent in the field of gearing.

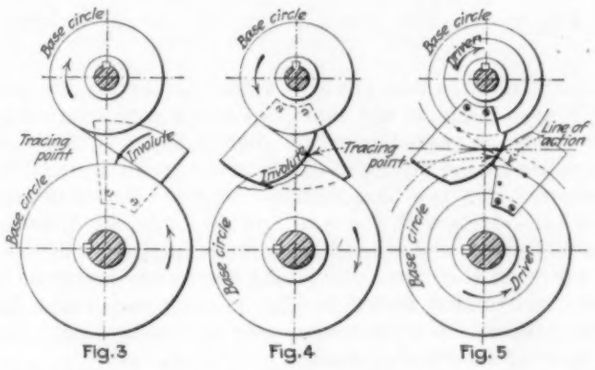


FIG. 3. TRACING CURVE FOR LOWER GEAR. FIG. 4. TRACING CURVE FOR UPPER GEAR. FIG. 5. TOOTH CURVES IN UNIFORM ACTION

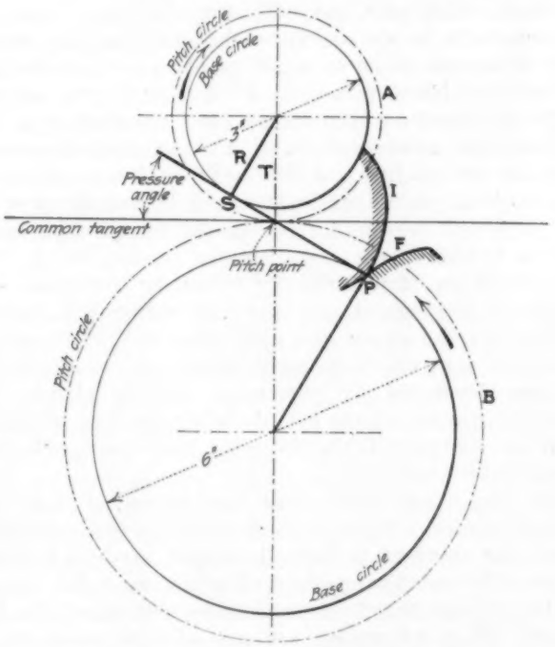


FIG. 6. GEARS OF DIFFERENT SIZES

With teeth shaped to involute outlines, gears are today performing feats which with other shapes seemed impossible a few years ago. The involute is not alone responsible for this advance, but it has been a great factor, due to the comparative ease of its duplication and its ability to operate properly at various, and sometimes varying, center distances.

The involute is that curve traced by a point on a

Paper presented at Rochester meeting of American Gear Manufacturers Association.

cord as the latter is unwound from a cylinder, known as the base circle. The pencil point, Fig. 1, fastened to the cord traces the involute curve as the cord is un-

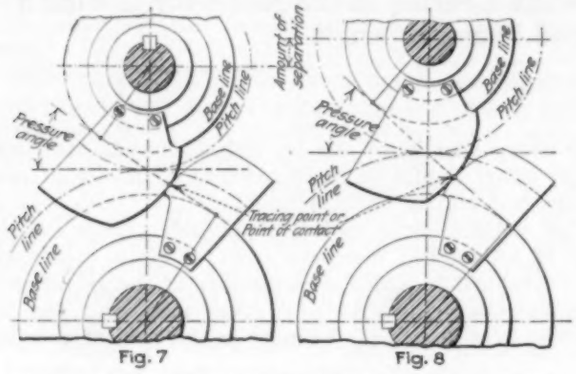


FIG. 7. GEARS IN NORMAL ACTION. FIG. 8. GEARS WITH CENTER SEPARATED

wound from the base circle. In Fig. 2 a card is attached to a base circle of the same size and a cord carried by the same is passed over an idler pulley. If the cord is pulled in the direction of the arrow, with a frictional resistance on the base cylinder to keep the cord taut, the base circle with the cord will rotate in the direction of the arrow, and a tracing point in the cord will draw a curve on the card. Obviously the curve developed is identical to that traced in Fig. 1, since each curve has been traced by points on cords unwound from base circles of identical diameter.

In Fig. 3 is a pair of disks, the upper one being two-thirds the diameter of the lower. If the cord with the tracing point be wrapped about the two disks and the lower disk provided with the recording card, an involute will be drawn upon that card as the upper disk is rotated so as to wind up the cord and unwind it from the lower member. In similar fashion an involute is traced on a recording card mounted upon the smaller disk, as shown in Fig. 4. If the cards are cut carefully on the involute line and mounted as shown in Fig. 5, it is plain that as the cord is wound upon the one disk and unwound from the other, the two cards will be in continuous contact at the tracing point, since the curves are simultaneously traced by that point. If the cord is removed and one disk member is rotated uniformly, the other disk will also uniformly rotate, since its rotation is brought about by contact of involutes developed by the same tracing point. The straight portion of the cord is called the line of action, because contact of the involute surfaces takes place along this line.

In Fig. 6 are shown two base circles of 3 in. and 6 in. diameter. A cord wound about the two and tightly drawn is assumed to have developed the two involutes shown through the medium of a tracing point therein. It is apparent that two complete revolutions of the 3-in. circle will wind up an amount of cord equal to the circumference of the 6-in. circle, and will thereby cause one complete revolution of the latter. It is also known that the involute faces *I* and *F* will be in continuous contact along the line of action, the contact beginning at *P* and ending at *S*. If several involutes, as *I* and *F*, are properly spaced about their base circles, and the base circle of 6 in. diameter is rotated continuously, it follows that the set of involutes carried on the larger, engaging those on the smaller, will at each revolution cause two revolution of the smaller.

If from the base-circle centers, other circles having the same diameter ratio as the base circles, are drawn tangent to each other, we may consider them as a pair of properly proportioned disks upon which may be located involute projections developed from the base circle, thus effecting a positive drive. These circles are called the pitch lines and their point of tangency is called the pitch point. The pitch point is also defined as that point at which the line of action crosses a straight line drawn through the base-circle centers. The common tangent is a line at right-angles to the line of centers and passing through the pitch point. The pressure angle is the angle which the line of action makes with the common tangent.

In Fig. 7 is shown a pair of base circles with templets and involute shape obtained as in Fig. 5. The cord

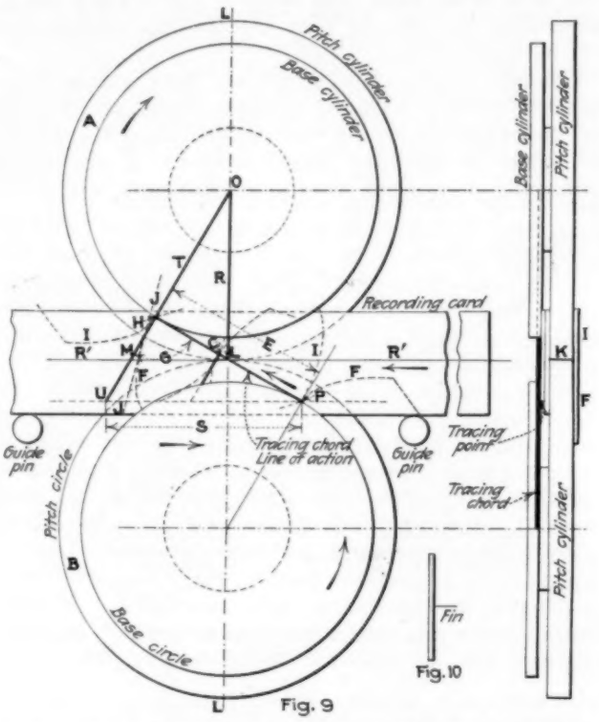


FIG. 9. RECORDING ACTION ON CARD. FIG. 10. END VIEW OF TRACING DEVICE

wound about the two disks represents the line of action. If the two centers are further separated, as in Fig. 8, and both disks are free to rotate upon their centers, the cord will inevitably keep the profiles in contact, since the involutes cannot possibly escape from the tracing points which define them. It is apparent, too, that the line of action makes an increased angle with the common tangent, denoting increased pressure angle. It is evident also that the pitch point appears in a new position.

In Fig. 9 are shown two base circles *A* and *B* of identical diameter. Involutes *I* and *F* have been developed from these base circles by methods previously described. It is assumed that the two involutes are securely fastend to the base circle. If involutes *I* and *F* are mounted on the back faces of the disks, they may act as means of rotation, permitting the installation of a recording card and tracing cord with tracing point as shown. As *F* is rotated in the direction of the arrow, thus driving *I*, contact of the two involutes takes place along the line of action. The recording card is

of rectangular shape, running on guide pins and free to move endwise. In Fig. 10 is shown an end view of the recording card having a fin of infinitesimal thickness. This fin is tightly pressed by the pitch cylinders at *K*, and it is assumed that their rotation causes endwise movement of the recording card at exactly the peripheral speed of the disks and at right-angles to the line of centers. If the tracing point is pulled along a distance *E*, any point in the base circle obviously moves the same distances, but a point in the pitch circle moves a greater distance, and by amount in direct ratio of the radius of the pitch circle to that of the base circle. Therefore, when the tracing point moves a distance *E*, the recording card moves distances *S*. Evidently then

$$S = \frac{R \times E}{T}.$$

It should be plain that line *M* is traced on the recording card as the tracing point travels the distance *E*, and the starting point on the card moves the distance *S*. *M* is the resultant of both forces acting in a straight line. Therefore *M* also is a straight line.

The involutes *I* and *F* and the straight line *M* have all been traced by a point in a cord being wound upon *A* and unwound from *B*, and the three are in simultaneous contact in any position along this line. Note contact at *C*. It can be mathematically determined that line *M* stands perpendicular to the line of action. It will be noted from observation of the straight line *JJ* that this line has been drawn at an angle other than 90 deg. with the line of action and just touching, or tangent to, involute *F*. It does not pass through the point of contact of involutes *I* and *F*, and therefore does not meet the conditions for satisfactory operation with the involute curve. From all this it is evident that a member traveling in a straight line tangent to a circle struck from a base-circle center must be provided with a straightedge or tooth to properly engage a surface of involute outline. This straight-tooth member is known as the involute rack.

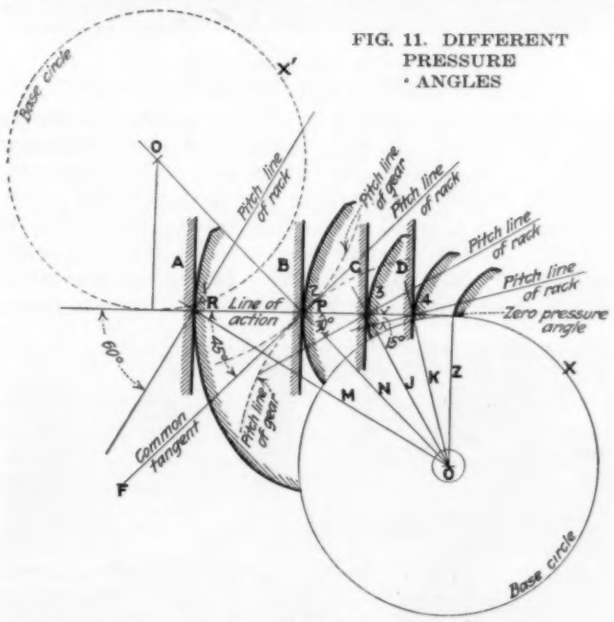


FIG. 11. DIFFERENT PRESSURE ANGLES

In Fig. 11 is a base circle *X*, and tangent to it is drawn a straight line *P* representing the line of action. Straight lines perpendicular to line *P* will evidently function properly as involute rack teeth since they fulfill the conditions already set forth of being straight and at right-angles to the line of action. The line *CO* is drawn through the intersection point of one of the straight lines and the line of action. The center of circle *X'* is the same distance from this intersection point as is the center of circle *X*. Circles *X* and *X'* have the same diameter. The line of action becomes also tangent to *X'*. Here is a condition like that shown in Fig. 9, and it is evident that the pitch point *P* is determined by the distance in a straight line from centers of the base circles to the intersection of line *B* with the line of action. This is represented by line *N*. The common tangent of the gear pitch circles becomes the pitch line of the rack.

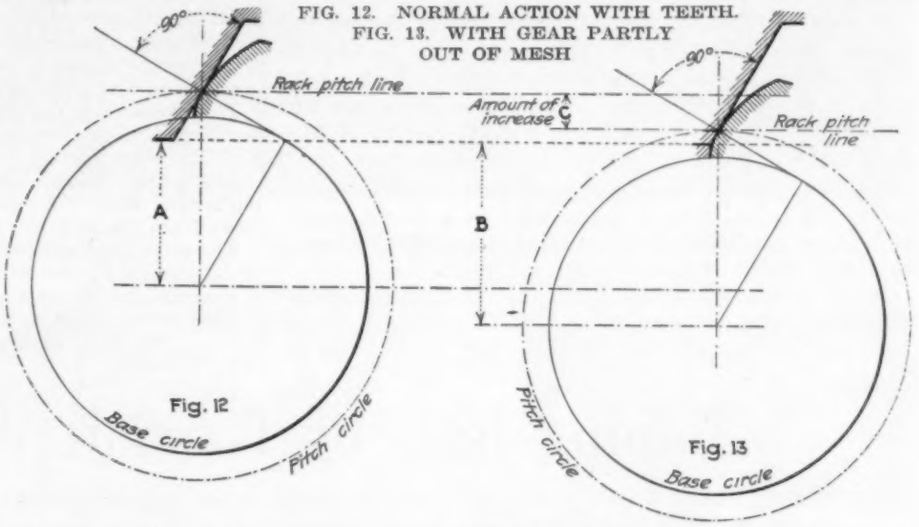


FIG. 12. NORMAL ACTION WITH TEETH.
FIG. 13. WITH GEAR PARTLY OUT OF MESH

The Pressure Angle

The pressure angle, being the angle which the line of action makes with the common tangent, is determined by the direction in which the straight line action as a rack tooth, moves. Obviously, the length of the gear pitch radius (as line *N*) determines the common tangent, thereby establishing the direction of travel and the pressure angle. It is interesting to note the effects of the lengths *M*, *N*, *J* and *K*. They result in the various rack pitch lines indicated, and the pressure angles are 60, 45, 30, and 15 deg. If the radius *Z* is used as a pitch radius, the straight line representing the rack tooth becomes a point. Its direction of travel is that of the line of action, and its pressure angle is zero. The gear pitch radius must intersect the line of action. Base circles must have radii of some length, as for example *Z*. It is therefore apparent that however great we may imagine the pitch radius to be, it must still make an angle (however slight) with the line of action. We conclude that the greatest theoretical pressure angle is almost but never quite 90 deg.

It has been demonstrated that a change in base-circle center distance affects the pressure angle of two involute curves developed from these circles. This is not true

when involute and rack are brought into contact. It has been demonstrated and laid down as fundamental, that the line of action must lie at right-angles to the rack tooth line. Fig. 12 shows these members in mesh at distance *A*. Fig. 13 shows distance *A* appreciably increased and indicated by *B*.

In order to keep the line of action at right-angles to the rack face, the pitch point has moved a distance equal to *C*, and established a new position for the rack pitch line. It is noteworthy that increasing the distance of base-circle center from rack has not affected the pitch circle of the involute. From the foregoing we may make the following conclusions concerning the involute curve, the term involute being used in a broad sense as being of an indefinite length and not confined to our usual conception of a gear tooth:

The involute is wholly determined by the diameter of the base circle.

An involute moving about its base-circle center, imparts rotative motion to a contacting involute in the exact ratio of their respective circles.

An involute has no pressure angle until brought into contact with another involute or a rack.

The pressure angle is determined by the center distance of the base circles.

The pressure angle once established is constant.

An involute has no pitch diameter until brought into contact with another involute or a rack.

The pitch diameter of an involute contacting another involute is determined by the center distance.

The pressure angle of an involute contacting a rack is unchanged when the base-circle center is moved toward or away from the rack.

The pitch diameter of an involute contacting a rack is unchanged when the base-circle center is moved toward or away from the rack.

The pitch line position of an engaging involute and rack is determined by the intersection of the line of action with a line passing through the base-circle center and perpendicular to the direction of rack travel.

(*To be continued in next week's issue.*)

Joining Bars by Thermit Welding

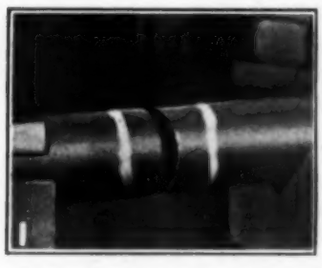
Long Bars Needed for Making Lead Screws of Rifling Machines—Aligning the Sections—Making the Mold and Weld—A Trussed Shipping Crate

BY L. I. GRINNELL

RECENTLY two long rifling machines for rifling 10-, 12- and 16-in. guns were built for the U. S. Arsenal, Watervliet, N. Y., by the Driggs Ordnance and Manufacturing Co., New Haven, Conn.

The screws for operating the rifling bars were 64 and 74 ft. respectively. To make these screws, bars of the above lengths and $4\frac{3}{8}$ in. in diameter were necessary, but as bars of such length were not available, they were made by welding a number of shorter bars together by the Thermit process.

The sections to be welded together were lined up, two at one time, in V-blocks so that a 1-in. gap was left between the two pieces, as shown in Fig. 1. The usual operations customary in Thermit welding were then followed, namely: inserting the pattern wax between



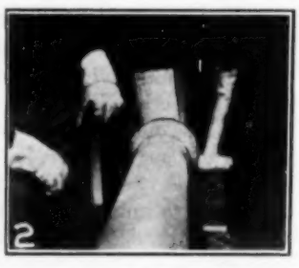


FIG. 1. GAP FOR WELDING. FIG. 2. ONE OF THE WELDS

the parts to be welded and shaping a wax collar around the gap, surrounding the wax by a mold, burning out the wax by means of a preheating torch, preheating the sections to be welded and tapping the liquid steel (generated at about 5,000 deg. F. by the Thermit reaction) from the bottom of a crucible into the mold. Fifty pounds of Thermit were used in making each of the welds. Fig. 2 shows one of the welds after removing the mold. Fig. 3 shows about one half of the welded bar.

After the collars of the welds were turned off and the stock threaded to form lead screws, it was practically impossible to detect the location of the welds. Cutting one of the screws is shown in Fig. 4.

The transportation of the screws was one of the difficult parts of the job, as the screws were very flexible

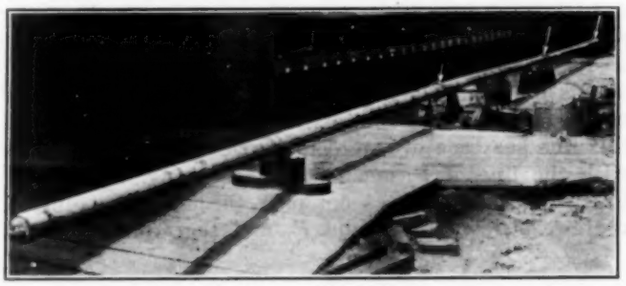


FIG. 3. PART OF A WELDED BAR

and all precautions had to be taken to prevent springing them in transit. It was necessary to box them and build a truss to hold the box in line. This truss was mounted on two-wheel trucks which were towed to the flat cars by a small caterpillar tractor, as shown in Fig. 5. Another tractor was used to hold the outfit back when descending grades. Owing to the great length, it was necessary to use three flat cars to trans-

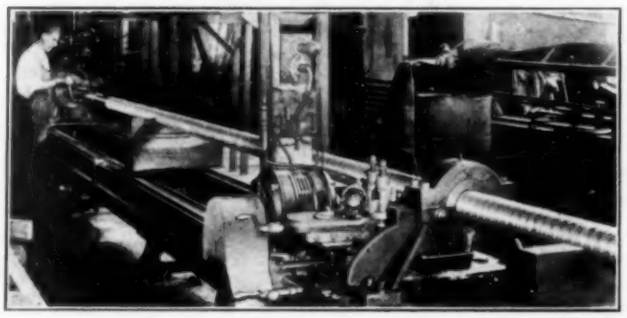


FIG. 4. CUTTING ONE OF THE SCREWS

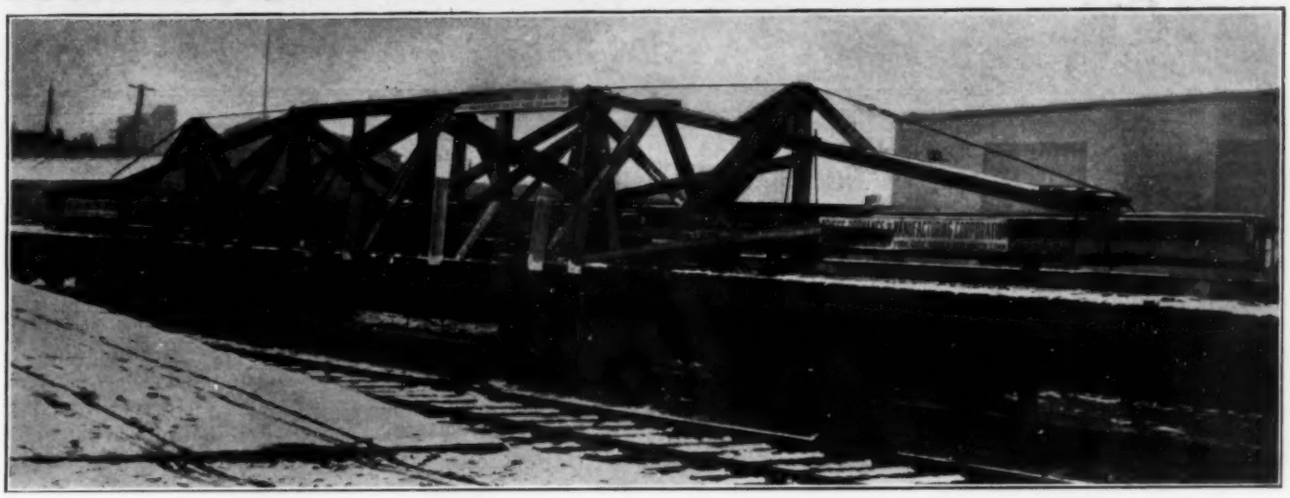


FIG. 5. TAKING THE CRATE TO THE RAILROAD. FIG. 6. THE CRATE ON THE CARS

port the crated screws by railroad. The weight was carried by the center car and the extra length overhung the other two cars, as shown in Fig. 6. In this way the truss construction prevented the overhanging ends from springing and made it possible to carry all the weight on the center car, preventing the screws from being subjected to any motion while the cars were going around curves. The screws arrived at the Arsenal without damage.

Suggested Readings in Economics

In our attempts to acquire a working knowledge of economics we are likely to be hard put to know what to read. Of considerable value, therefore, is the following list of suggested readings, compiled by Alvan T. Simonds, president, Simonds Saw Manufacturing Co., Fitchburg, Mass.

In referring to the list Mr. Simonds says, "These suggestions are made in response to many inquiries. They are for beginners. Doubtless there are many other books just as good, except in the case of Adam Smith. A dozen titles might easily be added to the advanced list and hundreds to the special list."

FUNDAMENTAL

The Wealth of Nations, by Adam Smith. Macmillan Company.

ELEMENTARY

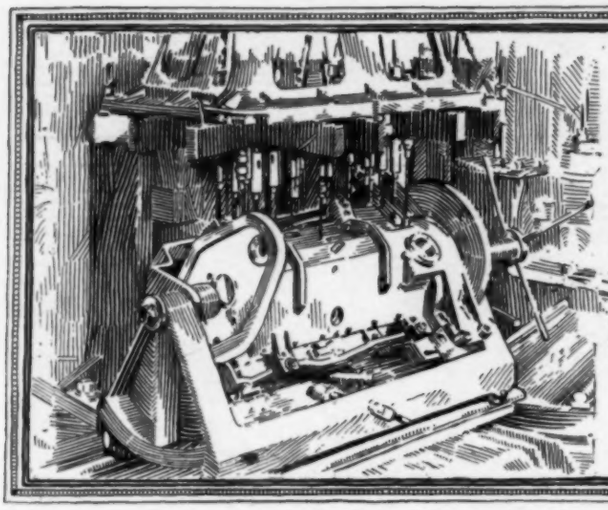
American Economic Life, by Burch. Macmillan.
Elementary Economics, by Carver. Ginn & Company.
Our Economic Organization, by Marshall & Lyon. Macmillan.
An Introduction to Economics, by Laing. Gregg.
How the World Makes Its Living, by McPherson. Century.
Readings in Industrial Society, by Marshall. University of Chicago Press.
The Unsolved Riddle of Social Justice, by Leacock. John Lane.
Wealth—Its Production and Distribution, by Kirkaldy. Dutton.
Ecoromics for the General Reader, by Henry Clay. Macmillan.

ADVANCED

Principles of Economics, by Taussig. Macmillan.
Current Economic Problems, by Hamilton. University of Chicago Press.
Economic Development of the United States, by Lippincott. Appleton.
The Wealth and Income of the People of the United States, by King. Macmillan.
Profits, Wages and Prices, by David Friday. Harcourt, Brace & Howe.

SPECIAL

The Case for Capitalism, by Withers. Dutton.
The Flow of Value, by McPherson. Century.
Stabilizing the Dollar, by Fisher. Macmillan.
History of Labor in the United States, by John R. Commons. Macmillan.
The Theory of Business Enterprise, by T. Veblen. Scribner's.
The Meaning of Money, by Hartley Withers. Dutton.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Boring Tools Continued—Methods of Adjusting Cutters—Use of Round and Rectangular-Section Cutters —Piloted Boring Bars—Multiple-Cutter Boring Bars

THE matter of provision for the adjustment of cutters in boring bars is an important one, yet it is not generally given the consideration to which it is entitled. The method provided should be such that it will be convenient, easy of access and accurate. There is some difference of opinion as to whether adjustments can be made more conveniently by means of a wrench on a square-head screw, or by the use of a screwdriver in the slotted end of a screw. The writers favor the latter method, as the position of the tool can be more easily controlled by means of a screwdriver than by a wrench. Existing conditions in the construction of the bar and the location of the cutter make it necessary to use different methods, but the matter of convenience and ease of setting should always be considered.

In Fig. 305 are shown a number of examples to illustrate the different methods which can be used for the purpose mentioned. In the case *A* the tool *B* is set straight across the bar and held by a setscrew at *C*. The adjustment provided for this tool is made by means of a headless slotted screw *D* of slightly larger diameter than the tool itself. The hole is, therefore, tapped nearly half way through the bar in order to permit of considerable adjustment. This tapping of the hole takes away a part of the bearing for the tool, and it is therefore objectionable. A better arrangement is shown at *E*, in which the tool *F* is backed up by a screw smaller than its own diameter. This screw can be used with a filler block to follow up the tool until the latter becomes so short that the limit of its life has been reached. A similar arrangement using a headless screw is shown at *G*.

In the example *H* the tool *K* is of rectangular shape and the hole is broached entirely through the bar. To provide for adjustment, a recess is milled at *L* and into this the block *M* is fitted. A headless setscrew, shown at *N*, is used to make the adjustment. It may be well to state here that adjusting screws are preferably made of fine pitch, usually between 24 and 30 threads per inch.

Another method of adjustment sometimes found convenient for confined situations is shown at *O*. The tool *P* is ground to an angle of 45 deg. at *Q;* and against this surface the shoe *R* bears, so that when it is acted upon by the screw *S*, it will force the cutter outward. This construction can be varied somewhat by using a cone point screw instead of the shoe.

A method that can be used to operate and adjust a cutter which is inconveniently situated is shown at *T*. This design also employs an angular principle by using the rod *U*, which is beveled at each end and acted upon by the screw at *V*. A method like this can hardly be recommended, except in extreme cases where difficulty is found in placing a screw so that it will act directly against the end of the cutter. In the example *W*, the tool *X* is adjusted by means of a lever *Y* which lies in a slot on one side of the bar. It is acted upon by a screw *Z*, which causes the tool to move outward when pressure is applied.

In the example *Z-1* the tool *Z-2* is adjusted by means of a plug *Z-3*, which is tapered as indicated and drawn up by means of the nut at the end of the bar. This method provides exceptional stability under the tool and the adjustment can be readily made.

When rectangular tools are used, two methods are employed; one of these is to tap the rectangular hole so that a screw of suitable diameter can be used and the other is to drill a hole of slightly larger diameter than the rectangular one and fit it with a screw, using if necessary a small shoe between the end of the screw and the tool. This method is illustrated at *Z-4*.

Flat cutters are frequently used in boring bars instead of the round or square variety which have been described. There is considerable difference in the cutting action, as the flat-blade type is usually double ended so that each end cuts. Strictly speaking, boring bars with flat cutters do not generate the hole; but they are nevertheless very useful, as they are capable of removing considerable stock. There is, however, no adjustment for diameter other than the grinding of the cutter to the specified size. This construction avoids the possibility of errors caused by an inaccurate setting of the cutter, and the tool can be used with considerable success by inexperienced workmen. It is subject to several objections, however, the first being the fact that the hole is not generated. The second is that there is no up-keep to the cutter, so that after it becomes worn it must be reground and used for some diameter

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smaller than that for which it was originally intended. For certain classes of work and under some conditions, excellent results can be obtained by the use of flat-blade cutters of various kinds.

In Fig. 306 is shown at *A* a portion of a boring bar furnished with a flat-blade cutter *B*. The method of fastening this cutter in place is by means of a wedge *C*. The bar *D* is milled away on two sides at *E* and *F* equidistant from the center. The cutter is carefully fitted with shoulders which exactly fit the bar at these points, thus giving it the correct location. Relief is provided at *G*, so that the action of the wedge *C* causes the cutter to bear only at the outer portions of the bar. A wedge like that shown is rather objectionable for several reasons. One of these is the fact that there is a slight tendency to distort the bar, another is that it is inconvenient, and a third reason is that the projecting end of the wedge may interfere with chip clearance. It is often used, however, although there are other methods which are to be preferred.

The example *H* shows an end-cutting, flat-blade boring tool at *K*. This tool locates in the bar in the same manner as that previously described, but it is held in position by means of a round pin *L* flatted off on one side to a taper. When this pin is driven into the bar it enters a hole in the cutter and draws the latter back strongly against the shoulder. This method is much superior to the wedge shown at *C* and is used in many bars for holding both flat cutters and the round variety.

Another method which can be used for a cutter of this general type is shown at *M*. The cutter *N* is of rectangular shape and locates in the bar as in the previous

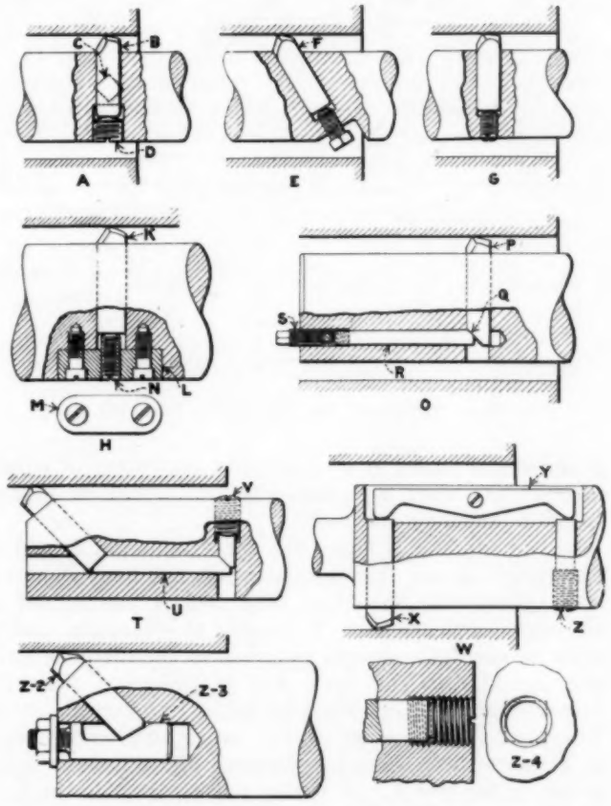


FIG. 305. METHODS OF ADJUSTING BORING TOOLS

example. It is held in place by means of two setscrews at *O* and *P*, instead of by a wedge. A point of importance in connection with the use of double-end cutters is the grinding of the tool at the point, so that the opposite faces are in line with each other and at the same time in line with the center of the bar. The sectional view at *A* brings this point out clearly.

Flat cutters are sometimes made so that they can be

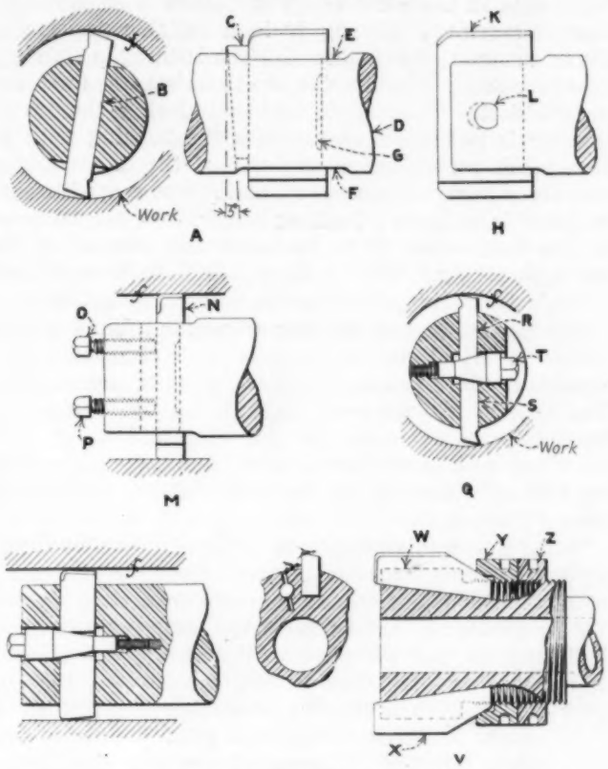


FIG. 306. FLAT CUTTERS FOR BORING BARS

adjusted for diameter. Various methods are in use, several of these being shown here. In the example *Q* the tools *R* and *S* are separate, and are expanded by means of the special tapered screw *T*, which bears equally on the inner end of each cutter. A suitable method of fastening the cutter after it has been adjusted must be provided. In the example *U* the principle used is much the same, but the adjusting screw enters the end of the bar instead of the side. Care must be taken in either of these two cases to make sure that the screw has a cylindrical bearing on both sides of the taper, in order to insure accuracy.

Another method of adjusting flat-blade cutters is shown at *V*. The cutters *W* and *X* are fitted to the taper slots shown, and adjustment is obtained by means of the lock nuts at *Y* and *Z*. The nut *Y* is beveled, so that it has a holding-down action on the cutters. The other end may be secured by means of a tapered pin in a slot, as indicated in the end view. There are other methods of adjusting and fastening cutters of this kind, but the principles illustrated here cover those which are best known and most used in tool designing.

Piloting Boring Bars

The advantages of a piloted boring bar have been previously mentioned, but the method of piloting has not been taken up. Fig. 307 shows a number of examples which illustrate the use of the pilot in connection with bars for boring. In the example A the work B is held on a faceplate fixture in which a bushing *C* is fixed. The bar *D* has a pilot *E* which enters the bushing, and guides as well as supports the bar under the pressure

of the cut. This is the simplest type of piloted boring bar. It is, perhaps, unnecessary to state that both bar and bushing should be hardened and ground.

Another example, shown at *F*, indicates a method which can be used for piloting a boring bar used in a blind hole in the work *G*. The fixture is so arranged that it carries a bushing *H* in a suitable position to act as a support for the bar *K*. The bushing is a sliding fit on the bar and remains on it at all times, as indicated by the dotted lines at *L*. When indexing the turret the bar is pulled out and carries the bushing with it. It depends somewhat on the size of the hole whether this arrangement is necessary, as in some cases it might be possible to make a bushing larger than the diameter of the hole which is to be bored and proportion the bar accordingly. When a blind hole is to be machined, a method like this can often be used to advantage.

Another method of piloting a bar for a blind hole is shown at *M*. Here the bushing *N* is supported in a bracket *O* which is attached to the ways of the machine. The bracket may be made in such fashion that it can be thrown back out of the way if a number of tools are being used in the turret in the same operation. The method of attaching to the ways of the machine is clearly shown.

When a large diameter is to be bored, like that shown at *P*, the work may be supported and located on a pilot *Q*, which is fastened into the face plate fixture. The toolholder *R* can be furnished with a bushing, as indicated, so that the pilot on the fixture will enter it and steady the tool against the pressure of the cut. This construction assists in producing accurate work. Care should be taken whenever a pilot is used to provide means for the releasing of any air compression which may be caused by the pilot entering a blind hole. The hole *S* takes care of the matter in the example shown.

The bar *T* is not greatly different from that shown at *D*, except that it is provided with oil or chip grooves. Many manufacturers provide all boring bars with grooves of this sort, both for the purpose of lubrication and to prevent trouble which might be caused by chips being carried into the bushing and scoring both it and the bar. A point of importance in connection with the length of the pilot should be mentioned here. In the example *T* the pilot enters the bushing only a short distance before the cutting tool starts on the work. It is much better to proportion it so that it will have more support, as indicated at *U*. While the short distance that the bar *T* enters the bushing might be sufficient when both bar and bushing are new and are accurately ground to size, after a time both bushing and bar will become worn somewhat and the bushing may be "bell-mounted." As any freedom of motion here would produce chatter, it is better to allow for a greater length of pilot in the hole before the cutting tool starts.

In designing pilot bushings for boring bars it is common practice to make them with a round corner, as shown at *V*. This is not good practice, however, and should be avoided in all cases, as the round portion permits chips to gather on the bar and to be drawn into the bushing. If the bushing is made as shown at *W* with a sharp corner and if the bar is chamfered on the end as indicated, there will be no trouble caused by chips, even if the bar is not grooved. It is not advisable to round the end of the bar as shown at *X*, as this construction is likely to cause the same kind of trouble.

When several diameters are to be bored, it is customary to arrange the tools in one bar whenever possible. There are several points in connection with the arrangement of the tools which are important. They can best be illustrated by means of examples. Fig 308 shows a piece of work *A*, which is bored to two different diameters by means of tools *B* and *C*. For work of this kind the tool *C* can be set either straight or at an angle, but it must be placed so that it will pass through the hole a short distance before the completion of the cut made by the tool *B*. If tools are arranged in this way, it is not necessary to be particularly careful as to the grinding of the faces of the tools. In the example *D* a similar condition is shown. Both tools

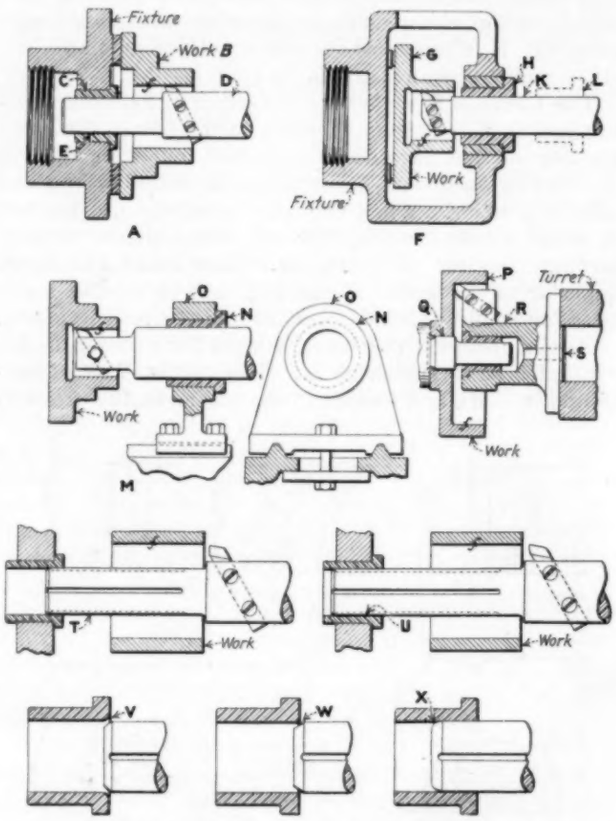


FIG. 307. METHODS OF PILOTING BORING BARS

E and *F* are placed at an angle, but as the tool *F* passes through the work no great difficulty would be experienced in grinding the faces.

In the example *G* there are three tools, *H*, *K* and *L*. The tool *H* passes through the work, but tools *K* and *L* stop against the shoulder. The tool *H* can be set at an angle; but the tool *K* is also at an angle, and it must be carefully ground to preserve the distance from one shoulder to the next, and at the same time the diameter at the point must be taken into consideration. This means that a great deal of care would be necessary to preserve both shoulder distance and diameter when grinding the tool *K*. A better way to arrange the tools for a piece of work like this is shown at *M*. Here the tool *N* extends through the work and is set at an angle. Tools *O* and *P* are set straight and the distance between the shoulders is determined by grinding the faces of the tools. The setting is much simplified when

tools are arranged in this way. Another example, at *Q*, shows boring tools at *R* and *S* and a facing tool at *T*. The tool *R* extends through the work and is set at an

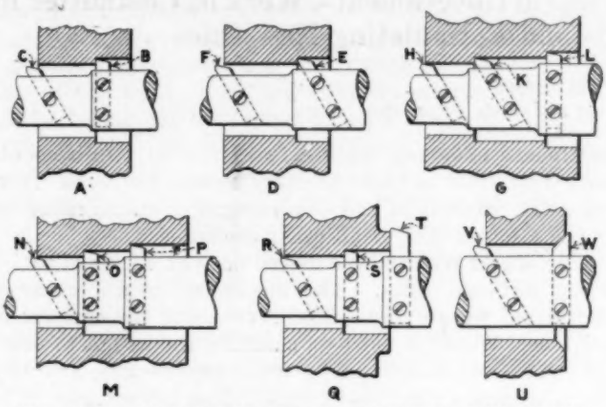


FIG. 308. ARRANGEMENT OF TOOLS IN MULTIPLE BORING BARS

angle, but both of the tools *S* and *T* are set straight for the reasons previously mentioned.

In the example *U*, tool *V* extends through the work and tool *W* cuts a chamfer, as indicated. The tool *V* is set at an angle while that at *W* extends straight across the bar. The principles shown in these diagrams are valuable, yet they are frequently not considered by a tool designer. Multiple bars are often made with three or four angular tools which are intended to bore diameters and preserve shoulder distances at the same time. When this is done it is often necessary to make up a special gage for grinding, and a great deal of trouble is usually experienced in setting the tools correctly.

It is not always profitable to bore large and small diameters at the same time on account of the difference in the speed at the various points. A great deal depends upon the work which is being done in combination with the boring tools. If an outside diameter is being turned while a small diameter is being bored, the speed of the work must be proportioned according to the speed of the largest diameter. In such cases, it is good practice to bore as many diameters at once as the tool set-up will permit.

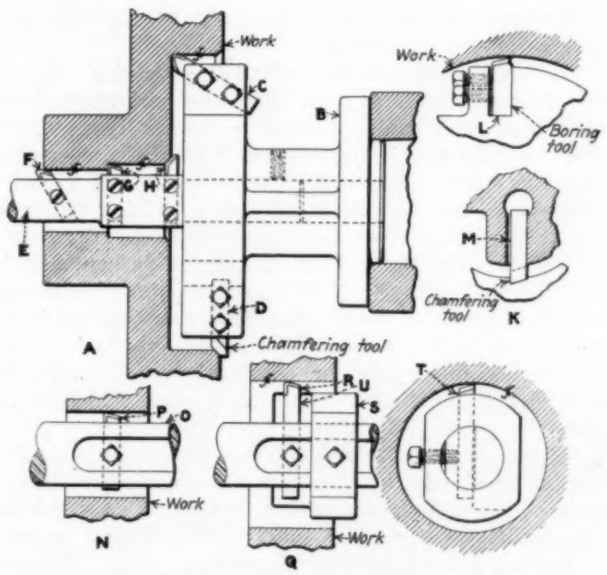


FIG. 309. MULTIPLE BORING BARS FOR LARGE AND SMALL DIAMETERS

In Fig. 309 is shown an example at *A* which requires a multiple set up of boring tools. A special holder *B* is fastened to the turret face and contains a boring tool *C* for boring the large diameter and a chamfering tool *D* for finishing the angular portion. The holder *B* is also provided with a multiple boring bar *E* in which are three tools, *F*, *G* and *H*, used for boring, cutting to shoulder and chamfering, respectively. In the matter of setting the tools for work of this kind, the principles which have been previously described should be employed. The detail at *K* shows a method of fastening the tools in the holder. The casting is slotted out at *L* and *M* to receive the tools, and square-head setscrews are used to hold them rigidly. No provision for adjustment is made in either case, other than by hand. It would be easily possible to provide the tool *C* with a backing-up screw for convenient adjustment.

When bars of a standard type are being used, there is an occasional necessity for boring a hole considerably larger than that for which the bar is designed. In the example *N*, *O* is a standard bar provided with a square tool *P*. It is evident that for other considerably larger diameters the tool would overhang from the bar so much that it would be likely to chatter. Provision can be made for this condition, as shown at *Q*, in which the cutter *R* is much longer than that shown at *P*. A head *S* is fitted to the bar in such a way that the tool is well supported by it. This method is of considerable advantage when machines are equipped with standard bars which must be adapted to a considerable variation in the diameter of work. Care must be taken when using a supporting member of this kind to make sure that it fits the tool closely at the points *T* and *U*, so that it will resist the pressure of the cut in both directions without permitting vibration.

Italian Automobile Manufacturers Active

BY H. C. MACLEAN
Commercial Attaché, Rome

American automobile manufacturers, especially of low-priced cars, will have to meet considerable competition from Italian manufacturers.

The Ansaldo Co., which during the war manufactured war material solely, including guns, armored cars, war vessels, etc., is turning out small, popular passenger and commercial cars. These cars, while not having the pretensions of well-known Italian makes, are to combine the advantages of a convenient price and low running cost and upkeep. The four-passenger touring car sells f.o.b. factory at 30,000 lire, chassis without body ($1,185 at exchange rate on Oct. 21, the date of the commercial attachés letter), and 42,000 lire, chassis with body ($1,659).

Details are on file in the automotive division of the Bureau of Foreign and Domestic Commerce and will be furnished on request by referring to Exhibit File No. 49255.

The Fiat Co. is gradually returning to normal working conditions, according to the "Agenzie Economic Finanziaria," difficulties with the personnel having been overcome. During August 600 automobiles were turned out; 800 during September; and 1,000 were planned for October, all of which have already been sold. The warehouses of the company are practically empty, there being only 200 motor trucks on hand, and these are expected to be readily absorbed by the domestic market. The construction of commercial cars will be suspended during the coming year.—*Commerce Reports.*

Significance of Standardization

Need for Co-operation Between Industry and Federal Government—Work of Committee in Harmonizing Conflicting Standards and Formulating New Ones

By A. A. STEVENSON
Chairman, American Engineering Standards Committee

TO THOSE of us who have been actively interested in standardization work for a number of years, the significance and importance of standardization to industry and to the Federal Government seems almost axiomatic.

From the many advantages to be derived by both industry and the Government from standardization along these lines, I have selected a few of the most important:

(1) Mass production, with its obvious advantages to the producers, means reduction in cost, and competition would insure to the consumers, including the Government, the benefit of a reduction in price.

(2) The elimination of side varieties and sizes permits producers to concentrate on those retained, and makes possible improvements in methods and equipments that will ultimately result in the elimination of waste and the reduction of cost to the consumers, including the Government.

(3) Fairness in competition in both domestic and foreign trade is promoted by putting all tenders on an easily comparable basis, to the benefit of both the producer and the consumer.

(4) The elimination of indecision in both production and utilization removes a prolific cause of inefficiency and waste.

(5) Stabilization of production and employment means for the producers the uninterrupted manufacture of stock during periods of depression, and it is of vital interest to the Government as being of benefit to the country as a whole.

(6) The accumulation of stock means prompt deliveries by the producers, and eliminates the necessity of the Government itself carrying a large inventory of material. What has just been said by way of reference to the significance of standardization to industry and the Government brings out forcibly the mutuality of the interests of these two in standardization, and shows how the benefits which accrue to industry from standardization, in turn prove beneficial to the Government. Does it not show conclusively the desirability and necessity of their friendly and hearty co-operation in the standardization movement?

The present is a particularly opportune time for the launching of extensive co-operation between Government and industry. The U. S. Government is probably the largest purchaser of materials in the world. It maintains an unrivaled group of research organizations, the one object of which is the furthering of the development of our industries. In addition to the continuing work of the Government in promoting the national welfare through such aids as it may properly give to industry, the efforts of the present Administration have shown a keen appreciation of the importance of standardization and of its bearings upon industry as a whole, and constitute a most significant development in the relation of the Government and industry. The War and Navy Departments obviously have certain special requirements with reference to their military needs, but aside from these the interest of the Government in standardization is the same as that of all other consumers.

The World War showed us the need of standardization along national lines. The desirable results obtained therefrom were of unlimited services to the country as a whole. Would it not be a calamity for us not to profit by the lessons taught us by these experiences, adapting them to peace time conditions? The advantages to be derived from national standardization are no less real in the midst of the post-war readjustment struggle.

In outlining some of the factors tending to emphasize the significance of standardization, I have not mentioned the great importance of standardization in helping to retain our foreign trade and meet keen competition from abroad. In both Great Britain and Germany national standardization is being carried on intensively.

Industry and Government at Fault

For reasons for which neither can be blamed exclusively, there is no doubt that the industries of this country and the Government departments in many instances have not co-operated in a way to insure best results in standardization along national lines. In my opinion both have been at fault. In national standardization the co-operation of the Government is necessary to industry, and the co-operation of industry is just as necessary to the Government.

In order to obtain the maximum of benefit from co-operation with industry, the Government should not attempt to set up standards at variance with standards acceptable for use by others for identical purposes. It should consider itself one (although a very large one) of the many consumers, and in its dealings with the manufacturers should co-operate with other consumers in formulating standards acceptable to both the producers and the consumers.

The great benefit to be derived from having only one set of standards is so great that the producers should be willing to comply with more severe requirements that are uniform, in preference to less severe requirements that are different for each consumer or group of consumers; the consumers should be willing to accept less severe requirements, thereby obtaining the benefit derived from economy in manufacture, rather than insisting on the more severe requirements with the accompanying added costs. An ideal specification is one which can readily be met by a producer who is competent and willing. When a specification is so severe that it condemns much good material, it results in economic waste.

The relation of the great Federal research bureaus to industrial standardization is no less important than is that of the great purchasing bureaus. Research and standardization are very closely related, and in many ways they are supplementary to each other. By showing the need of reliable information as to the facts, in order to determine what is the best practice, and to

Abstract of paper presented at meeting of American Engineering Standards Committee, Dec. 9, 1921.

secure agreements on moot questions, standardization acts as a powerful stimulus to research and development. But what is of even greater importance, standardization is one of the principal means of getting the results of research and development work into actual use in the industries, so that the industries themselves, and finally the general public, may reap the advantage.

One of the most direct and effective methods of getting the results of the investigational work of the research bureaus introduced into, and of service to the industries, is by co-operation between the research bureaus and the industries, through working standardization committees, which must necessarily be joint committees of the various bodies interested in each specific project. The many advantages of such co-operation, both to the industries and to the bureaus, are obvious.

What is no less important, such co-operation is very effective in helping to extend a knowledge and appreciation of the work of the bureau in the associations that speak for the industry. As illustrating the significance of this matter, it may be mentioned that more than a hundred national organizations are now co-operating through accredited representatives, in the work of standardization committees which are working under the auspices and rules of procedure of the A. E. S. C. In this work the Bureau of Standards, the Bureau of Mines, and the Forest Service are taking a very active part, and in so doing, are rendering extremely important service to their respective industries.

The various governmental departments need not fear that encouragement given and aid extended to such activities will in any way detract from, or militate against them in their own field of work. Quite the reverse, as I am positive the final result would be greater appreciation by industry and the public at large of the benefits to be derived from close co-operation with governmental agencies already established, and in turn these agencies would receive more of the credit they are entitled to for what they have done and are doing.

In order that standardization along national lines may be brought about, it is necessary that there be some central body to act as a clearing house in standardization work. The need for closer co-operation in order to prevent duplication and the promulgation of conflicting standards in America crystallized in the appointment of a committee by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials, which formulated a plan resulting in the organization of a permanent committee made up of representatives of the five societies mentioned and the three Government Departments of War, Navy and Commerce. The constitution of this committee, known as the American Engineering Standards Committee, was broadened later to permit the representation of other bodies.

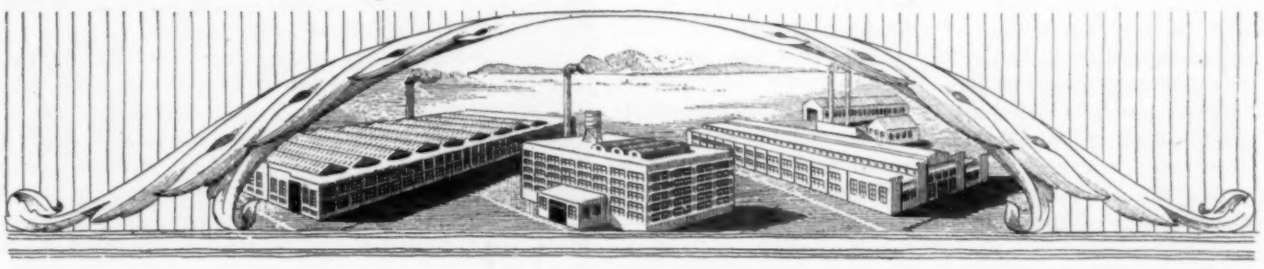
As a result of the work in which the American Engineering Standards Committee is now actively engaged, existing conflicting standards are being brought into harmony, and there are being created truly representative committees to formulate new standards. The methods employed in accomplishing these admittedly desirable results obviously differ somewhat from methods utilized hitherto, and it must be acknowledged that they are not yet fully understood by many of the organizations in America that should be co-operating in standardization along national lines.

The decision of the American Engineering Standards Committee not to deal with technical details has proved a source of great strength in its real work which is to insure the full co-operation of organizations producing standards that are not in conflict.

In determining the desirability of undertaking the development of a proposed standard, it has proved highly satisfactory to initiate the movement by calling a conference of the bodies interested, which the American Engineering Standards Committee does upon request from a responsible organization or organizations.

The plans laid down for carrying out the work of standardization will insure that the co-operative spirit brought into being by the conference will continue to be the controlling feature of the work of eliminating existing conflicting standards and "Americanizing" the standards that will be formulated hereafter. I do not think too much emphasis can be put upon the advantages of the conference method of initiating work on any particular standard or set of standards, provided the conference is truly representative. When men get together in such a conference, from an interchange of ideas they obtain a comprehensive view of the whole field.

It cannot be too often repeated, that a national standardization program means almost unlimited advantage to the manufacturer in cheapening the processes of production and stabilizing his market; to the distributor in clarifying and simplifying his problems; and to the ultimate consumer by lessening costs and expediting deliveries with whom the Government as a purchaser is to be included; and to the Government as a body of great research agencies, by selling the results of its researches to industries in return for an increased prestige with the general public and an increased support from industry. In my opinion the real significance of standardization to industry and the Federal Government—what it may mean and what it can accomplish, will not be fully realized until there is a sincere co-operation, sympathetic, systematic and comprehensive, between industry and the Federal Government, in which co-operation the general consumer has a part.



Manufacture and Use of Diamond Cutting Tools

II. Polishing or Lapping the Stone—An Operation in Which Lack of Skill May Prove To Be Very Expensive—Wire Drawing Dies

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

OWING to the extreme hardness of the stone, the only method of cutting or shaping the diamond is by lapping it, using as an abrasive the dust formed by pulverizing fragments of the diamonds themselves.

In shaping a diamond to form a cutting tool, advantage is taken of the cleavage lines and a piece of the stone is split out of a crystal as nearly as may be possible to the size and shape required.

The diamond cutter never "grinds" a diamond. The operation is always referred to as "polishing" or "lapping," though the result to be accomplished is exactly

FIG. 9. SHOWING HOW THE STONES ARE HELD TO POLISH THEM

what a machinist would call grinding—that is, the cutting away by abrasion of a portion of the stone to produce a flat surface.

The diamond cutter's lap, upon which most of this work is done, is a disk of cast iron about 11 in. in diameter mounted upon an arbor of steel that is held in a vertical position upon centers, or "pivot" bearings, and rotated at a speed of approximately 2,200 r.p.m. by means of a quarter turn belt from below. The side of the disk that is uppermost is faced off true and smooth and is charged with diamond dust by covering it with a mixture of the dust in oil. The fine particles of diamond dust become embedded in the iron by the pressure and rubbing of the work.

One of the machines is shown separately in Fig. 9, and in Fig. 10 is one of the devices, called by the diamond worker a "tong," by means of which the diamond is held upon the lap.

The lapping or polishing is one of the most important parts of the diamond cutting trade, and his value as a workman depends upon the speed and accuracy with which the diamond cutter can reduce a rough stone to the required shape and dimensions.

Not a little of his skill is manifested in the way in which he cares for his lap. These disks are of a special grade of cast iron imported from Holland and Belgium especially for this purpose, and out of three or four castings the diamond worker will pick one that he thinks is most suitable for fine polishing. This lap he will jealously guard from his fellow workman, for he does not want to entrust a tool upon which he has expended so much time and labor in making it smooth and free from scratches to another, who, he suspects, will not be so careful of it.

The working surface of the lap is first ground true, after which the workman painstakingly rubs it criss-cross fashion with an "emery stone," filling it full of minute scratches or burs, running in a radial direction, that will later enfold and retain the fine particles of diamond dust that constitute the real cutting medium.

The lap runs continuously and a worker may have as many stones upon it as there is room around the periphery to accommodate the tongs. Flat bars of iron called "tong plates" are fastened to the bench by means of lag screws, each bar having an upwardly projecting steel pin at either end which holds the tong from being swept out of place by the friction of the stone upon the revolving lap. The position of the tong plate is readily adjustable as a lag screw passes through a slot in the bar. The manner in which the tong plates are disposed about the lap may be clearly seen in Fig. 9.

The tongs are made of wood with "feet" at one end to rest upon the bench and a clamp at the other to take the

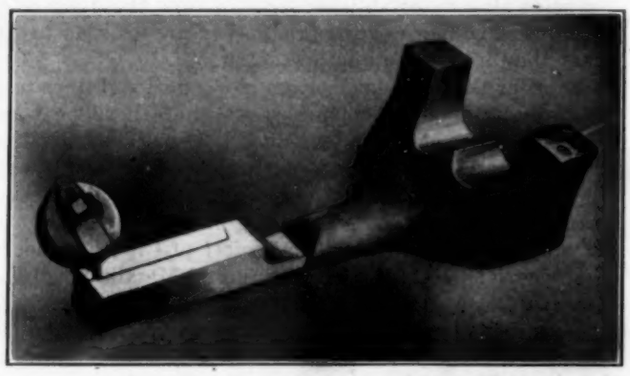


FIG. 10. A DIAMOND CUTTER'S TONG

stem of the inverted cup into which the diamond to be ground is set. Pressure is added as necessary to speed up the grinding by laying slabs of lead on top of the tong as may be seen in the case of the tong nearest the observer in Fig. 9. The pressure may be very nicely graduated by sliding the slab nearer to or farther from the end of the tong that is over the lap.

The cup-shaped contrivance of iron that holds the stone to be ground is called in the diamond cutter's parlance a "husk" or "dop." The cup only is of iron; the stem being a piece of stout copper wire by which the dop is held in the clamp end of the wooden tong. The stone to be ground is held in the dop in the same manner as was described in connection with Fig. 6, except that metallic lead or solder is used instead of wax; the reason for the substitution being that the

heat generated by the friction of the stone upon the lap would melt the wax and allow the stone to become displaced.

There is no adjustment to the dop except by bending the wire stem, but a diamond cutter becomes so expert at this little trick that he can set the stone at any required angle by a casual push with his thumb, guided

FIG. 11. MOUNTING A DIAMOND IN THE "DOP"

by his experienced eye, and rarely has he to try twice.

The polishing of the stones upon the dust impregnated surface of the lap is, of course, a very slow operation, requiring hours at best, and in case of a particularly refractory diamond, sometimes days, to reduce even one small surface to anything like flatness. It is a job that cannot be hurried, and when the diamond worker strikes a "knot" or extra hard spot in the diamond, he may have to grind for a week to get it out.

Strange as it may be in a material that is already the limit in hardness, some diamonds seem to possess this peculiarity. A hard spot that is exactly like a knot in a piece of wood is sometimes encountered, and unless the particular pieces wanted can be finished by

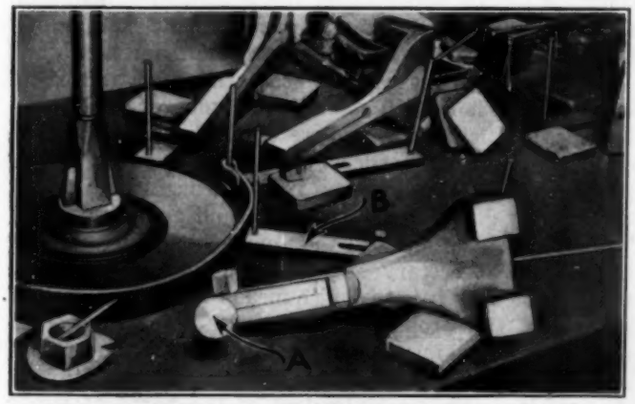


FIG. 12. TONG AND DOP WITH DIAMOND SET, READY FOR POLISHING

breaking, the stone must be laid aside or used for some other purpose.

The diamond worker has a way of mounting a stone in the "dop" that is rather startling to the beholder at first. We all know how a plumber will pour a mass of sticky, plastic lead upon a pipe, and, with a thick piece of felt in each hand, deftly "wipe" the lead around the pipe into a neat though bulbous looking joint. The diamond worker goes the plumber one better; he pours the plastic lead into the dop, sets in the diamond with a pair of pliers, and wipes the lead around it *with his bare fingers*. This sounds incredible, but so quickly are the movements performed that burned fingers rarely result.

In Fig. 11 a dop may be seen lying on the bench at *A*, and three others at *B*, *C* and *D* respectively; the two latter resting in the tops of the gas burners *E*, where the lead is heated. The lead is not allowed to reach the actual melting point but is brought so close to it that it becomes plastic, at which stage it is worked roughly into the shape of a cone by means of any small piece of wood or metal that may be handy.

The stone to be mounted is now placed upon the apex of the cone and pressed a little way into the soft lead; after which the dop is lifted from the burner—with tongs—and placed in the inner cavity of a sort of double cup, made of wood. The dop at *B* is shown in the cup.

The outer rim of this double cup is separated from the inner one by a distance of an inch or more, and the diamond worker, holding the cup in his left hand, passes the bare fingers of his right hand over and around the cone of hot lead and back across the outer edge of

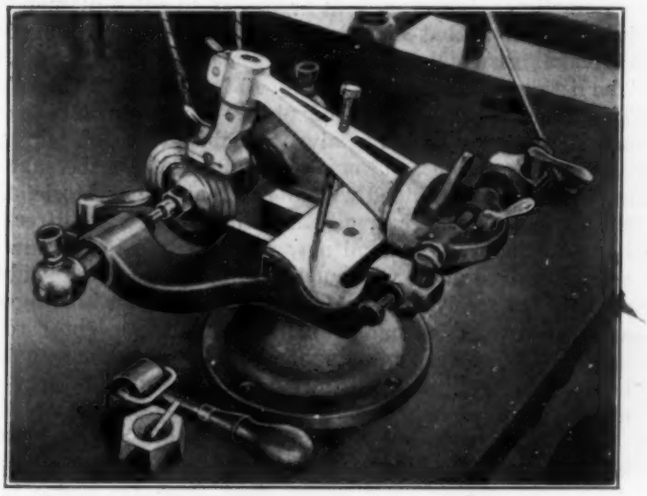


FIG. 13. A MACHINE FOR SAWING DIAMONDS

the cup with a movement so deftly and quickly performed that he scarcely seems to touch it; yet the lead is gradually but surely worked around the stone until the latter is almost completely enclosed, leaving exposed only that part which is to be polished. The office of the outer edge of the cup and the reason for drawing the fingers across it at each pass is to wipe off particles of lead that might otherwise cling to the fingers and burn them.

When the lead has cooled sufficiently, the wire stem of the dop is clamped in the wooden tong, as at *A* in Fig. 12, and so placed upon the tong-plate *B* that the exposed face of the stone bears upon the lap, where it is allowed to remain—being moved about from time

to time to forestall any tendency to wear grooves in the lap—until that face is reduced to the desired condition.

The diamond may be so set in the dop that the operator can by a push with his thumb bend the wire stem to bring another surface in contact with the lap, but this is possible only to a limited extent in tool work, though in polishing gems an expert worker will so calculate the setting that all of the many facets of a brilliant may be polished without resetting the stone. In making tools, the surfaces to be ground are usually at right angles and resetting is necessary.

The diamond worker may have as many as six stones upon his lap at one time, and though each may take a long time to finish, he is kept busy in resetting and changing them about to avoid roughing the surface of the lap.

In a previous section of this article a description was given of the method of splitting a diamond along the lines of cleavage to obtain pieces of suitable shape to make the required tools. Though it may require hours of study to determine *where* to split it, the actual operation of cleaving a diamond is a matter of minutes, and if the required shape can be approximated in this way a great saving of time is effected thereby.

Sometimes, however, it is necessary to cut a diamond in a direction that does not coincide with any line of cleavage; in which case the stone may be sawed apart. The little machine shown in Fig. 13 is a diamond "saw." The blade is a thin disk of phosphor bronze and the actual cutting medium is always diamond dust.

An overhanging arm, made of aluminum for the sake of lightness, is provided with a clamp at one end to hold the diamond to be cut, and is adjustable in all directions so that the diamond may be presented to the saw at any desired angle without loosening the clamps. The arm swings freely in a vertical plane upon pivot bearings and is provided with a stop screw near the center to limit the downward movement so that a stone may not be cut entirely apart during the absence of the operator. The feed is entirely by gravity.

Once set, the little machine will saw quietly away for hours or days, if necessary. Sometimes it is without attention, picking up diamond dust from the stone it is sawing and thus automatically recharging itself. The operator visits it occasionally to see that it is working properly and to add more oil as the blade gets dry.

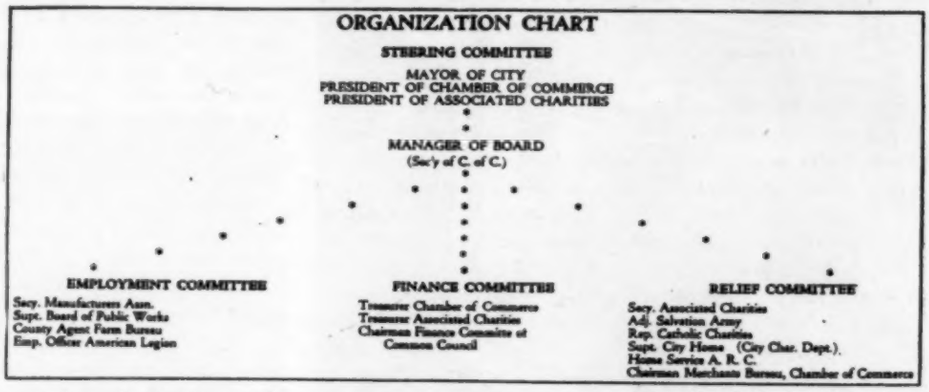
The bronze blades vary from 3 to 5 in. in diameter and from three to ten thousandths of an inch in thickness. The thicker blade is usually used to start a cut, and after it has gone deep enough so that the sides of the kerf will support it, the thin blade is substituted so that no more of the bulk of the diamond than is absolutely necessary may be wasted. Small ring-shaped weights of lead may be placed upon the arm to speed up the cutting if a large stone is being sawed, while on small stones the weight of the arm and clamp is more than sufficient. A one carat stone (roughly about $\frac{1}{8}$ in. through) will, if it is free cutting, be sawed apart in from three to five hours.

Poughkeepsie's Relief Work

By H. A. Schatz
President, the Federal Bearings Co.

It has given me a great deal of personal pleasure in reading on page 939, Vol. 55, of American Machinist, a very fine editorial that you have devoted to the Chamber of Commerce of Poughkeepsie and its activities in connection with unemployment relief.

It may interest you to know that forty-eight hours after we received a telegram from Col. Arthur Woods and another from Joseph H. Defrees, president of the Chamber of Commerce of the United States, requesting the co-operation of Chambers of Commerce in the unemployment situation, we had our plan worked out and a copy of it on the way to Washington, to both Mr. Hoover's office and the U. S. Chamber of Commerce; and seventy-two hours after we had received the telegrams, we were operating the plan in Poughkeepsie, and it is working continuously and successfully.



We have co-ordinated all of the charities in the city and clear them through the secretary of the Chamber of Commerce, thereby avoiding all duplication, and this even includes the City Home, which is municipal. Our scheme of organization is shown in the diagram.

The steering committee is intended to be the general guidance committee of the board. It receives the reports of the manager and acts as a directing committee for the solution of the entire situation.

The manager of the board, who is secretary of the Chamber of Commerce, is the executive head of the board responsible to the steering committee. His duties are to receive the reports on unemployment, the listing of jobs and general employment conditions from the employment committee; to recommend loans to the finance committee and to recommend relief to the relief committee. All applications for employment, loans or relief are made to the manager individually making one head in the city for all classes of relief.

The manager classes relief cases as *A*, *B* and *C*; *A* being the most destitute for which emergency relief is required; *B* being cases where employment is essential and some relief aid needed; *C* being cases where unemployment will bring distress in the near future; the *A* cases being given the preference on all openings.

The organization of the employment committee includes the secretary of the Manufacturers' Association, whose duty it is to devise means for the creation of new jobs, the proposed rotation of labor and other methods for making employment in industry after consultation with the directors of the Manufacturers' Association; the superintendent of the board of public works, whose duty it is to know of all openings on

public work in the city; to consult, suggest and try to put through the promotion of additional public work with the Board of Public Works of the city for the creation of more employment; the county agent of the Farm Bureau for the listing and securing of openings on farms; for the securing of seasonable occupation for part-time employment; the employment officer of the American Legion, for the general assistance in securing of odd jobs, day work, etc., not covered by the three above-mentioned members of the committee.

It is the duty of the employment committee to secure openings for employment; list the same with the manager of the emergency relief board; devise means for the creation of jobs; report to the manager the increase or decrease of employment by a careful survey weekly.

The members of the finance committee are the chairman of the finance committee of the Common Council of the city, representing the city funds for relief, charitable and employment work; the treasurer of the Chamber of Commerce, for the securing of funds from the mercantile, financial and manufacturing interests; the treasurer of the associated charities, for the representation of private interests and associated charities.

It is the duty of the finance committee to supply funds necessary for the general operating expenses of the board. Practically no overhead is to be paid due to the fact of using existing agencies; to establish a fund by the securing of a joint guarantee signed by fifty business men, establishing a credit on a note for $5,000, the liability to each signer to the guaranty not exceeding $100.

A plan has been devised whereby a credit of $5,000 has been established in the bank by the finance committee, secured by a guarantee as mentioned above. Loans are made by this committee upon the recommendation of the manager of the board after a careful investigation, loans being classed as moral loans, the individual borrower's note being accepted.

Loans are classed as follows:

(a) To individuals who are essential bread-winners, loans are made in amounts not to exceed $100 after a careful examination and investigation of the man's character.

(b) To the single unemployed man whose references are satisfactory, loans are made in amounts not to exceed $50.

(c) To applicants who might be classed as doubtful, loans are made in amounts not to exceed $25.

Notes are issued for a period of ninety days with the privilege of renewal if a substantial payment has been made and the circumstances warrant it. A small amount of interest is charged to remove any idea of charity which might enter therein and to cover any loss which might accrue from failure to pay on any individual note.

The relief committee is composed of the active, executive heads of all charitable relief organizations of the city, representing all denominations, as well as the charity department of the city.

Applications for the relief of destitute cases, such as medical aid, fuel, food and clothing, are made by this committee after a careful investigation by the social workers upon the recommendation of the manager of the board. A complete file of all charitable cases in the city is kept in the office of the board manager.

A daily report is made to the manager's office known as a confidential exchange, giving the name of the applicant, address and other particulars, as well as the relief given, which report is entered upon the individual card made out for each applicant, this file being the clearing house for the charity cases of the city. It prevents duplication of relief and investigation.

Forms used for the promotion of this plan and other information will be gladly supplied upon request by the Chamber of Commerce of Poughkeepsie, N. Y.

Grain vs. Flesh Side for Leather Belts

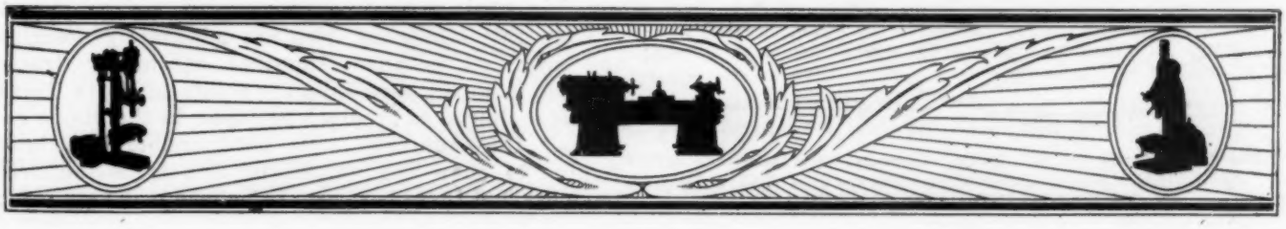
From the time when leather belts were first used for power transmission until the present, men have argued the question of whether a leather belt should be run with the grain or flesh side next to the pulley, without having any definite facts upon which to base their opinions or any more really concrete evidence than that of individual observation.

During the latter part of the past summer, tests of the capacity of the grain and flesh sides of leather belts were begun by the Leather Belting Exchange in its Research Laboratory at Cornell University. Covering a period of more than two months continuous tests were run on the testing apparatus belonging to the Leather Belting Exchange, which is being operated under the supervision of Cornell University, using five 4-in. single belts, 30 ft. long, of different manufacture. Every effort was made throughout the tests to standardize conditions and to reduce the probable error to a minimum, and this unquestionably was accomplished. All five belts were run long enough previous to the experiments to have been thoroughly "run-in," and had reached a condition of constant capacity.

The method of procedure was to take horsepower readings from the belts, first when running on the grain sides, and then when running on the flesh, the power being gradually increased until about 4 per cent slip had been reached.

To review the details of each individual test would require more space than is here available. Suffice it to say that a summary of all of the results is clearly in favor of the grain side from the standpoint of power transmission. In fact, it may be concluded from it that under reasonable shop tension, the flesh side will average ony 50 to 60 per cent as much horsepower as the grain side. At higher tensions the flesh side will do better, averaging from 50 to 100 per cent as much power as the grain, depending upon the belt, the tension and the conditions of service.

In short, the evidence produced from the mass of data obtained leaves no reasonable doubt but that there are distinct advantages in power transmission to be had from running leather belts on the grain side.



Changes in the Machinery Trade of China

Data Collected from Chinese Sources—Increase in Volume of General Machinery Business Done by America—Specific Figures on Textile Machinery and Machine Tools

By W. H. RASTALL
Chief, Industrial Machinery Division, Department of Commerce

THE PROGRESS made by American machinery manufacturers in developing export business and the superior position of American engineering equipment in the markets of the world is shown very plainly by the experience of China since 1911, as is illustrated very forcibly by the charts published herewith. It should be noted that this data is from Chinese, not American sources, being developed from the returns of the Chinese Maritime Customs.

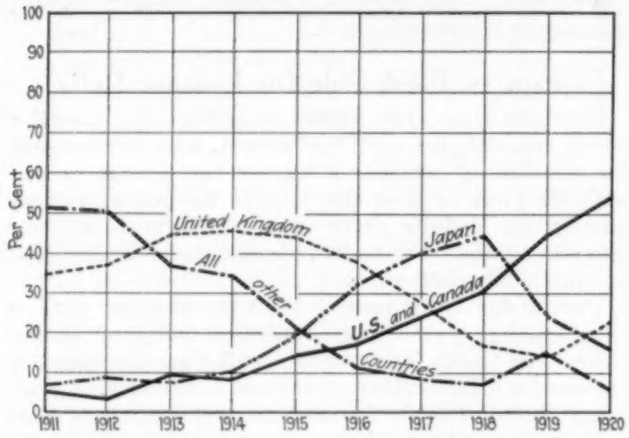


FIG. 1. PER CENT OF TOTAL VALUE OF IMPORTS OF INDUSTRIAL MACHINERY INTO CHINA, ORIGINATING IN COUNTRIES INDICATED, 1911 TO 1920
All machinery, except agricultural, embroidering, knitting and sewing machinery.

Conditions in China have differed radically from those in the other markets of the world because business there has been influenced very strongly by political forces, as has been called to public notice in connection with the Armament Conference. It has been customary to specify in loan agreements that the machinery required shall be purchased in the country furnishing the money with the result that the United States supplied China only about 30 per cent of the machinery she imported in 1918, as compared with 80 per cent supplied in the same year to Japan, which is and has long been an openly competitive market. Consequently it should be recognized that the progress indicated below has been made in spite of the difficulties encountered by those who sell machinery in China without financial assistance.

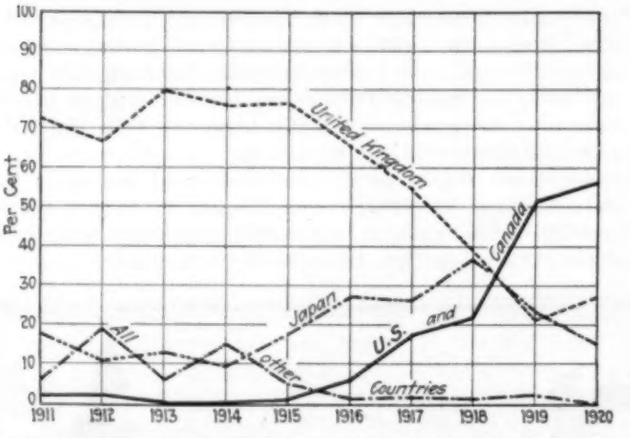


FIG. 2. PER CENT OF TOTAL VALUE OF IMPORTS OF TEXTILE MACHINERY INTO CHINA, ORIGINATING IN COUNTRIES INDICATED, 1911 TO 1920

The customs authorities in China always credit consignments to the last port of shipment, so that machinery built in the United States and shipped to China via Vancouver would be credited as from Canada. In recent years very important amounts of machinery have been shipped in that way and for this reason the charts show the total of the shipments from the United States and Canada, as it is felt that practically all of the machinery leaving Canada originated south of the boundary. Similarly it should be remembered that the shipments from "other countries" includes not only machinery from Germany, but important shipments from Holland, Belgium, Sweden and other sources, although in the period prior to 1914 Germany was the most important of these sources of supply. The progress made has been shown as a percentage in order to demonstrate clearly the comparative position of American exports in the China machinery trade, but this is a rather inadequate expression of the true situation as there has also been a most astonishing increase in the volume of this business, making it worth while to submit the accompanying figures showing the value of the shipments of the leading countries. These values are given in haekwan taels, the exchange value of which fluctuates very seriously, being worth about 65 cents in 1911, $1.03 in 1917, etc.

TABLE I. VALUE IN HAEKWAN TAELS OF MACHINERY IMPORT INTO CHINA
(Excluding agricultural, embroidering, knitting and sewing machinery)

Year	U. S. A. and Canada	United Kingdom	Japan	Total from All Sources
1911	382,054	2,330,209	465,122	6,561,020
1912	179,803	1,762,916	388,475	4,704,485
1913	673,227	3,241,590	548,522	7,137,048
1914	681,170	3,749,149	852,934	8,157,270
1915	659,722	1,994,518	851,185	4,485,867
1916	1,078,530	2,350,903	1,991,031	6,131,258
1917	1,411,141	1,648,869	2,419,813	5,982,715
1918	2,390,332	1,313,604	3,569,909	7,860,290
1919	6,407,727	2,073,968	3,604,905	14,328,249
1920	12,181,382	5,229,026	3,727,604	22,536,254

Increase in Exports Since 1911

From Table I it is evident that American machinery exports to China have increased 3,100 per cent since 1911. From Fig. 1 it is seen that the American share of the business of China has increased from 5.8 per cent, the lowest of the countries here mentioned, in 1911 to 54.1 per cent or more than all others combined in 1920.

Even this statement does not adequately describe the situation because American machinery transshipped in Japan, especially for points in North China and Manchuria, is credited to Japan in the above returns. Unfortunately, it is not possible to submit figures to show the volume of this trans-shipment business, but there is reason to believe it is very large

and during the war was strongly influenced by the demand in Siberia for war equipment.

The above refers to the experience covering all classes of machinery. If one wishes to be more specific, it is possible to submit corresponding charts regarding particular classes of machinery and in Fig. 2 is a corresponding record of Chinese imports of textile machinery. In this diagram the line representing Japan is also deceptive, as a considerable amount of the textile machinery exported from Japan is of a type employed in cottage industries as distinguished from the factory machinery shipped from Europe and

TABLE II. VALUE OF HAEKWAN TAELS OF TEXTILE MACHINERY IMPORTS INTO CHINA

Year	U. S. A. and Canada	United Kingdom	Japan	Total from All Countries
1911	7,161	241,234	60,159	331,582
1912	9,885	307,283	50,229	458,616
1913	2,615	672,150	112,500	839,724
1914	2,530	1,540,100	187,661	2,038,460
1915	15,446	1,076,229	253,490	1,419,511
1916	115,431	1,257,961	531,437	1,934,141
1917	218,928	669,649	302,607	1,235,800
1918	379,867	669,402	642,948	1,714,994
1919	1,944,350	813,254	897,760	3,767,406
1920	3,897,204	1,925,696	1,071,201	6,927,728

America. For Americans the interesting part of the diagram is the comparison between the experience of the United States and the United Kingdom in this trade. The superiority of American engineering as represented by cotton mill design and cotton mill equipment has been clearly recognized in China as also certain other countries, and it is anticipated that European designs will soon incorporate certain Ameri-

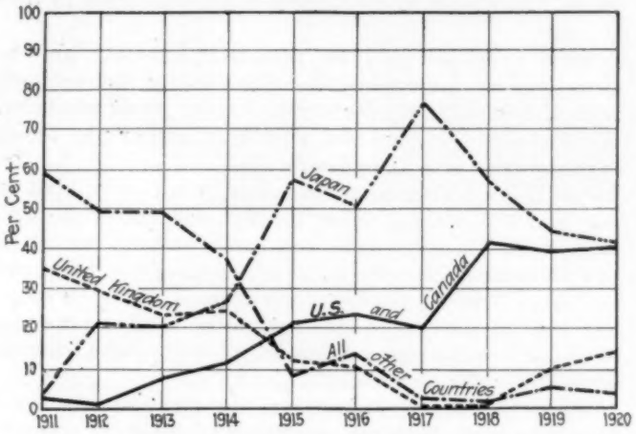


FIG. 3. PER CENT OF TOTAL VALUE OF IMPORTS OF MACHINE TOOLS INTO CHINA, ORIGINATING IN COUNTRIES INDICATED, 1911 TO 1920

can features. The values involved in this trade are shown in Table II.

It is thus very clear that the textile industry in China is growing very rapidly and the American interest in the trade is making even more rapid progress.

TABLE III. VALUE IN HAEKWAN TAELS OF MACHINE TOOL IMPORTS INTO CHINA

Year	U. S. A. and Canada	United Kingdom	Japan	Total from All Countries
1911	615	9,699	1,067	27,726
1912	133	5,726	4,112	19,629
1913	3,773	12,112	10,234	51,288
1914	11,001	24,040	25,771	96,912
1915	15,494	9,052	42,094	72,811
1916	23,403	10,772	49,740	97,778
1917	40,983	1,254	160,475	208,394
1918	145,547	2,598	198,954	349,108
1919	197,859	50,477	221,996	499,853
1920	305,780	111,038	316,636	761,073

Correspondingly, Fig. 3 illustrates the experience in connection with machine tools. This class of machinery is of a type that is strongly influenced by the loan and concession agreements being used very largely in connection with railways, mines, arsenals, dockyards, etc., and it is this that explains, to a large extent, the situation in 1911 and 1912. Subsequent experience is largely self-explanatory, but the above remarks regarding the trans-shipment of machinery from Japan should be remembered. It is true that Japan is trying to develop a machinery building industry and has paid especial attention to the production of machine tools, having more than twenty-six shops engaged in this business in 1918. It should also be remembered that Fig. 3 is plotted in percentages so that the high value shown on the Japan curve for 1917 is very deceptive. In that year European and American manufacturers shipped very little of this class of machinery because of the war embargoes. The volume of this machine tool business is shown in Table III.

Eight Reasons for Buying Now

Future profits of producers, wholesalers, and retailers depend as much upon taking advantage of the well-liquidated condition of the materials markets now as they did upon sensing the dangers of the inflated price position eighteen months or so ago. Paul Clay, well-known economist, writing in *Forbes Magazine* (N. Y.), enumerates the following eight reasons why the manufacturer and merchant should buy materials and supplies now:

(1) Labor Efficiency—Profits during the coming year will be much increased by the extra high efficiency of labor which invariably results from general unemployment.

(2) Interest Costs—Time money and commercial paper have come down from the 1919 maximum of 9½ per cent to a minimum of about 5¾ per cent, which reduces the interest cost of carrying materials and supplies bought in advance of requirements.

(3) Fixed Charges—The typical manufacturing concern when operating at 40 to 60 per cent of capacity has to pay most of its fixed charges and often some wages and salaries out of surplus. To increase output from 50 or 60 per cent to 70 or 80 per cent adds but little to operating expenses.

(4) Cheapness of Materials—In very many instances raw materials are selling so low as to be out of line with finished products, and, therefore, quite attractive.

(5) Statistical Positions—The statistical position of one material after another is becoming bullish; the ratio of supply to consumption is becoming such as to indicate higher prices.

(6) Visible Supplies—Large visible supplies of metals, minerals, textiles, and foodstuffs should be taken to indicate, not that raw material prices are going to continue declining, but rather that supplies of finished goods have been drawn so low as to insure a buying movement in raw materials.

(7) Material Prices—No one disputes the law of supply and demand; but the point now is that almost every leading raw material has already passed through its period of forced liquidation, with the result that prices, instead of being weak, are beginning to grow strong.

(8) Unemployment — General unemployment has been discounted. Moreover, re-employment has already begun in both Europe and America, and as labor gets back to work total consumption of goods and products must necessarily increase.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Roughing Miter Gears on a Milling Machine

By Bernard Gottschalk

Having occasion to cut several hundred miter gears of 1¼ pitch, 19 teeth, 3½ in. face, we rigged up an Ingersoll milling machine with the device shown in the sketch, Fig. 1, to make the stocking cut and thus save the time of the gear cutters.

The angular face of a 45-deg. angle plate was bored to receive two disks, the hubs of which fitted the bore of the gear blanks. The opposite hub of each disk extended through the thickness of the angle plate and

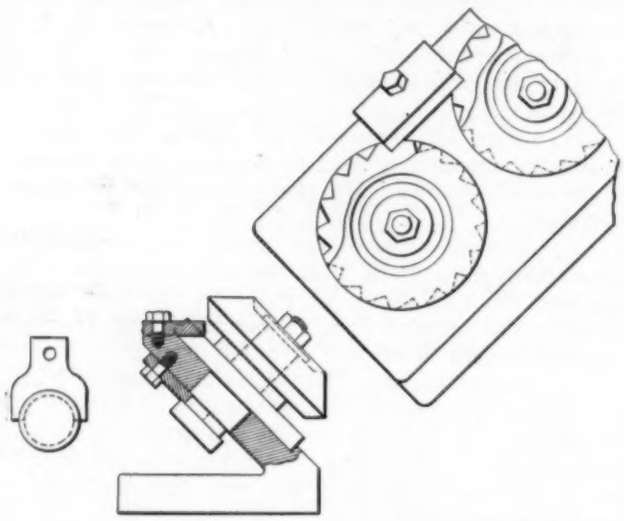


FIG. 1. OUTLINE OF SET-UP FOR STOCKING MITER GEARS IN A MILLING MACHINE

was grooved to take a forked piece that held the disk down to its seat, but did not prevent it from turning.

Angular notches in the peripheries of the disks provided the index plates, and a rectangular block held to the angle plate by a capscrew was so placed that a corner coincided with a notch on each disk at each indexing position; thus locating and clamping both disks with one movement.

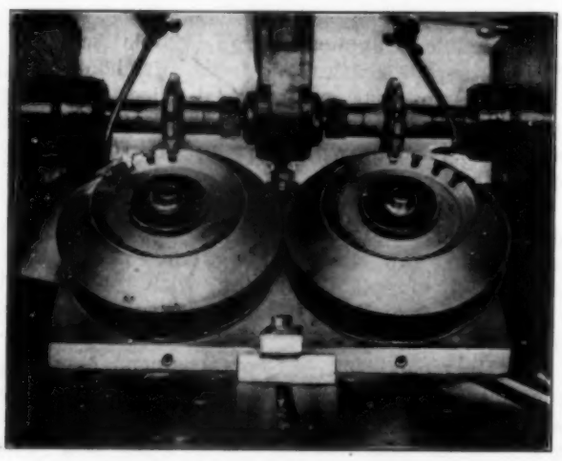


FIG. 2. SHOWING THE RIG AT WORK

The reproduced photograph, Fig. 2, shows the gear blanks in position with the cut well started. The indexing was, as a matter of course, done by hand.

Bushing a Blind Locating Hole

By John A. Yungwirth

On page 978, Vol. 55, of American Machinist, Charles Reimchissel tells us how to prepare a blind hole so that a bushing, once forced into it, may easily be removed.

The way he describes is, no doubt, an excellent one, *provided* the man who put in the bushing did it that way. But how about the many bushed holes in the preparation of which the toolmaker's only concern was to get the bushing *in*—let him worry who had to take it out.

Such bushings may be removed as easily and as quickly as by the method described by Mr. Reimchissel, without the necessity for any prearrangement whatever. All the tools necessary are a plunger, rod or pin, nicely fitted to the bushing, and some oil.

Fill the bushing about half full of oil (any kind of oil) and set in the plunger until it rests upon the surface of the oil. Now take a hammer and hit the top of the plunger a smart blow. The effect of the blow will be transmitted by the oil to the under side of the bushing and the latter will rise out of the hole as promptly as if the blow had been delivered directly by the hammer upon its under surface.

There is but one precaution; the plunger must be a *close* fit for the bushing, practically oil tight, or you will get a shower of oil instead of the bushing.

Collet Stop for Short Work

By Elam Whitney

On page 935, Vol. 55, of American Machinist, Gene Phelps describes a very good locating stop for use with the collet of a hand screw machine or turret lathe, for work not made from bar stock. The writer would suggest an improvement which he has tried and found satisfactory.

Instead of locating the threaded bushing or stop holder, between the collet and the closing tube, it is made a light press fit in the rear end of the collet. All collets used for chucking are provided with these bushings, which should all have the same size of thread. The collet and stop are thus self-contained and may easily be removed for adjustment and cleaning.

When practicable to do so it is advantageous to make the stop hollow to allow for an ejecting rod which is operated by the regular wire feeding mechanism of the machine.

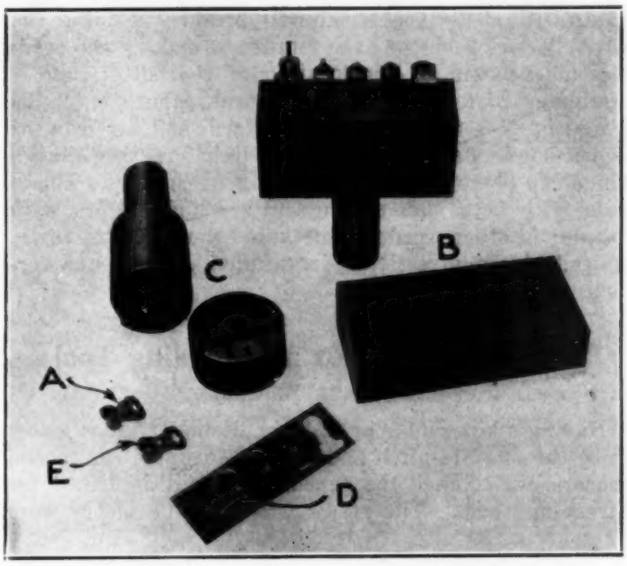
Progressive Operation Tools

BY WILLIAM CLANCY

Thousands of the little pieces, shown at *A* in the illustration, are used on the spinning frames in textile mills, and the job of maintenance assumes a magnitude all out of proportion to the size of the piece unless some way is devised to make them at very small cost.

In our shop the tools shown at *B* were worked out to blank, pierce and partly form them in successive steps. The material is half hard brass 0.017 in. in thickness and the stock is fed from a roll to a small bench press that cuts them out very rapidly. Up to the present time a second operation is required to put in the final bend and complete the piece, and this is a hand feed proposition; the tools being shown at *C*.

As may be seen in the strip of metal at *D* the first stroke of the press cuts out the contour part way round to blank, leaving the flat end still attached to the stock like the tongue of a reed. The second and third strokes draw up the bowl-like depression, the fourth stroke pierces the small round hole at the bottom of the bowl and the oblong slot in the flat end at the same time,



PROGRESSIVE FORMING AND BLANKING DIE

while the fifth stroke severs the partly finished piece and pushes it through the die. Thus, after the press has made five revolutions each step of the die is full and a semi-finished piece as at *E* is produced at each succeeding stroke.

The final bend is a double right-angle and no attempt has yet been made to incorporate it in the progressive tools, but the writer is of the opinion that it is quite feasible to do so and means to have a try at it some day.

An Adjustable Jig for Drilling Round Stock

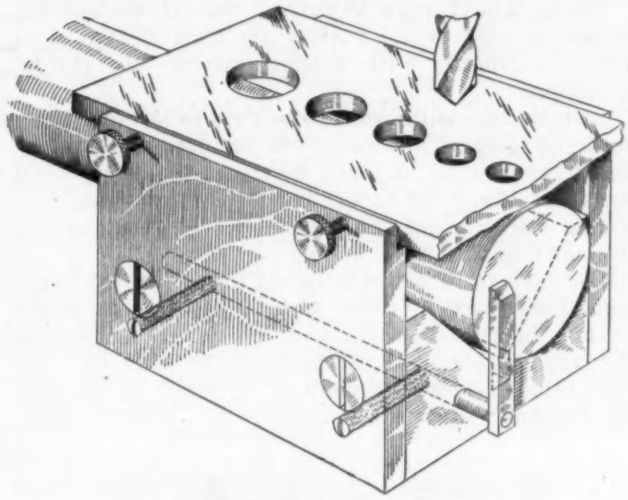
BY H. H. PARKER

The sketch shows a method of adapting a V-block to drill crossholes in round stock.

Side plates are screwed to the block, as indicated, and the upper edge of each plate rabbetted to form a groove in which the jig plate slides. Setscrews or thumbscrews in one of the side plates provide means for holding the jig plate in endwise position.

The jig plate should have a row of holes of the sizes commonly used, accurately located with reference to the center-line and the plate should be hardened.

If many pieces are to be drilled, a hole may be drilled



JIG FOR DRILLING ROUND STOCK

lengthwise of the block, under the V, and a rod and stop plate inserted as shown.

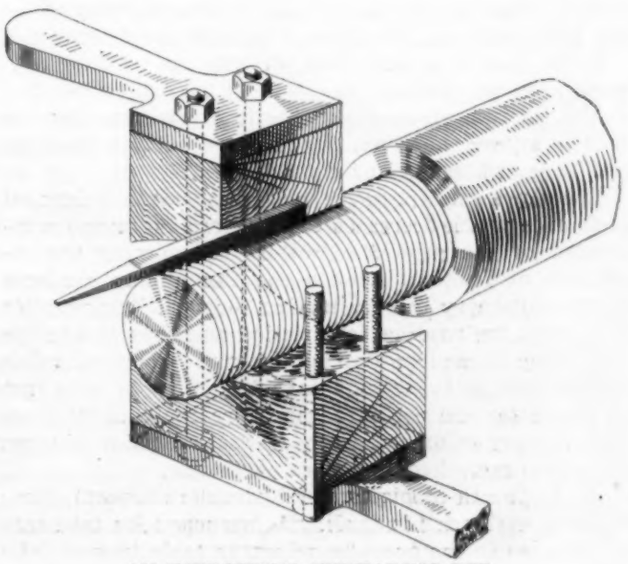
Redressing a Damaged Thread

BY JOHN COREY

The other day there came into our jobbing shop a shaft too long for any of our lathes. It had upon one end a much battered 8-pitch thread which required redressing.

As re-threading in a lathe was out of the question, I procured an 8-pitch inside thread chaser of the kind that was commonly used in the earlier days, set it into one of a pair of hardwood blocks, as shown in the sketch, and bolted the device together upon the damaged thread.

Clamping the shaft in the central slot of the planer table with the threaded end projecting, the "die" was worked back and forth by hand, tightening the clamping bolts a little at each pass until a clean, smooth thread was produced.



AN IMPROVISED THREADING DIE

Milling Machine Dynamometer

BY R. POLIAKOFF

On page 929, Vol. 55, of the AMERICAN MACHINIST, a "Thrust and Torque Measurer" was shown and described as used by John Airey and Carl J. Oxford in their experiments with milling cutters and milling operations.

In connection with same, permit me to say that practically an identical apparatus was designed and built by me as far back as 1913 and described in the technical press. In Fig. 1 the apparatus is shown mounted on a milling machine, and the principles of its construction are shown in Fig. 2.

The piece to be milled is bolted to a slide, the longitudinal movement of which is guided by grooves in the lever *A*, fulcrumed on points of screws passing through the lugs *B*, secured to the table of the machine. The slide bears against the point *K* of screw *L*, pressing the hydraulic support connected with a pressure gage.

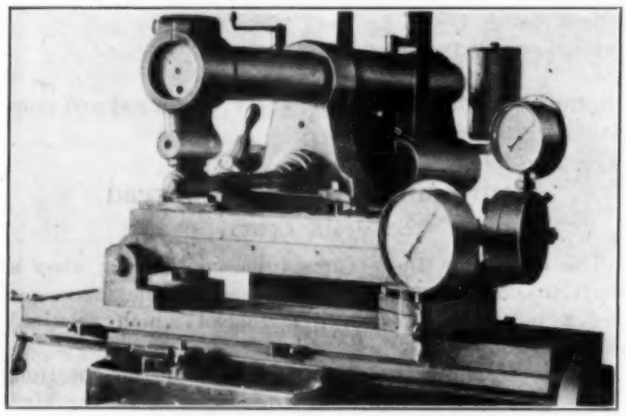


FIG. 1. THE DYNAMOMETER ON A MILLING MACHINE

In a similar way the lever *A* bears on the point *N* of the screw *O* which transfers the pressure to the support *P* connected with another pressure gage.

When the cutter rotates in the direction indicated by the arrow, the force exerted by the teeth resolves into a longitudinal pressure acting parallel to the table and a downward pressure acting at a right angle to the table. These respective pressures are transmitted to the gages and can therefore accurately be determined.

It can readily be seen that the leverage of the downward pressure changes as the table moves, in relation to the fulcrum about which the lever swings. As the feed is known, however, the leverage of this pressure can be determined at any moment.

The downward pressure also produces a frictional resistance which decreases the longitudinal pressure indicated by the gage *R*. But by determining the coefficient of friction between the two sliding surfaces in the usual way before starting the test, it is possible to correct the reading for friction and thus obtain the true value of the longitudinal pressure. Comparing this design with that shown on page 929, it can be seen that in the latter the pressure gages are replaced by pipes and mercury columns. From a practical point of view, the gages are, of course, more preferable.

As to the third piston (or hydraulic support) there is no necessity for it at all. Its purpose is to take care of changes in the pressure when the table travels from left to right. The same object can be accomplished by setting up an initial pressure in one of the vertical pressure gages and thus eliminating the other one.

The same drawback pointed out by Messrs. Airey and Oxford in their device, i.e., the changeability of the

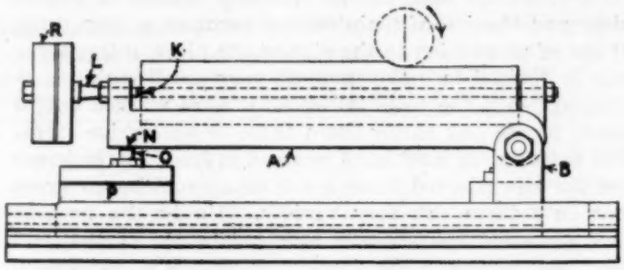


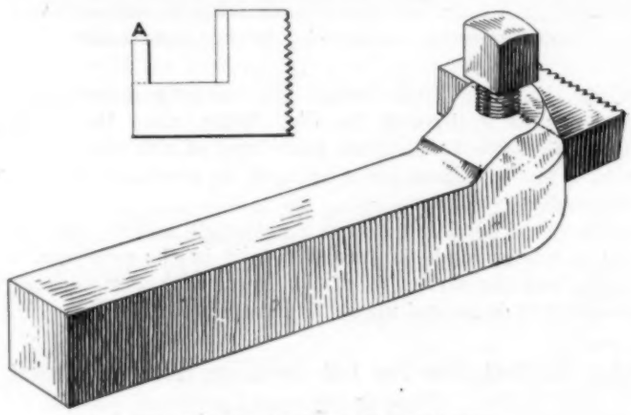
FIG. 2. PRINCIPLES OF THE DYNAMOMETER

leverage of the vertical pressure, applies as I have shown to mine. In order to avoid this, the dynamometer has to be built so that the reading of the lower gages will not be dependent upon the location of the cutter with respect to the table. This object has been accomplished by a later instrument of my design shown on page 114, Vol. 55, of the AMERICAN MACHINIST, and which is now manufactured by the Cincinnati Milling Machine Co. Not only does it embody the feature of making the readings independent of the location of the cutter, but it eliminates also the friction element inherent to the design of Messrs. Airey and Oxford, and my own, as shown here. Besides, it is an entirely practical design which can be applied to any milling machine and allows tests with both slab milling cutters and cutters with spirals; in other words, it measures the forces in three, instead of two, directions—longitudinal, lateral and vertical.

Using a Chaser for a Threading Tool

BY PAUL BEDELL

Having a large number of 1⅛-in. diameter brass pieces to be threaded 16-pitch and no time to waste for special chasers, we adopted the expedient herein described for threading them. The result was that the pieces were



CHASER IN ARMSTRONG HOLDER

turned out almost as fast as could have been done with a regular die head and with as perfect threads.

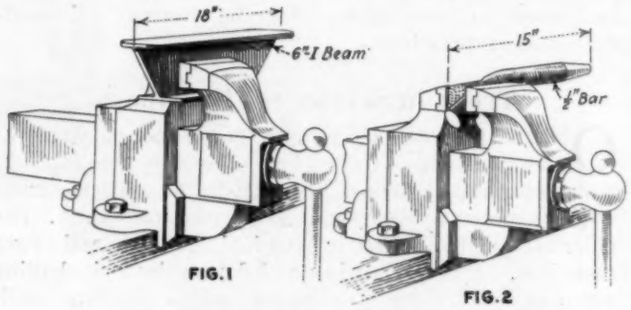
The pieces were threaded on centers in a lathe and the tool used was a 16-pitch Hartness chaser with the projection *A* ground off, as shown in the illustration, so that it could be held in an Armstrong toolholder. One pass over each piece was sufficient.

Handy Vise Attachments

By G. A. Luers

In the work of straightening parts that are bent or buckled, the vise attachments shown in the drawings are of exceptional service and are readily made up of odd parts about the shop. The first of these, Fig. 1, is made from a foot-and-a-half length of I-beam. This is clamped in the jaws of the vise, where it can be used for straightening out steering rods, brake rods, connecting rods and other similar parts.

Another attachment, Fig. 2, is made from an axle bent and drilled for retaining pins as shown. This is also held in the vise. The shaft or bar used should be 1½ to 2 in. in diameter and about 15 in. long. This tool serves as a horn for straightening tubular parts, as



FIGS. 1 AND 2. HANDY VISE ATTACHMENTS

manifolds, exhaust pipes, mufflers, etc.; also for riveting axle housings and flanges, and can be used where the larger and shorter anvil horn will not reach.

Avoid Danger When Drilling in the Lathe

By H. L. Gibbs

In reference to the article by G. E. Clifford under the above title, published on page 936, Vol. 55, of American Machinist, I would like to say that the carriage should not be "kept a little in advance of the toolholder," for the reason that the operator does not know just when the drill is going to break through.

If he will place a tool or a piece of tool stock in the toolpost in such a manner that the handle of the drill holder will rest on top of it, and at the same time have the toolpost *against* the back of the drill holder, the pressure of the tail spindle will push the carriage ahead of it as the drill advances, and the resistance of the carriage is thus *always* interposed to prevent any "digging in" of the drill.

The carriage feed must of course be in neutral position so that the carriage itself will be free to advance with the feeding movement of the tail spindle.

Attachment for Milling Automobile Front Spring Brackets

By R. E. D. Delrue

Amsterdam, Holland

The milling attachment described and illustrated herewith is used for milling the insides of the bosses of automobile spring brackets.

The device which was attached to the overarm bracket of the milling machine has a frame of forged mild steel provided with three recesses for carrying the gears. The cover *A* is screwed on the frame in order to give the gears a good bearing on both sides. This cover, as well as the frame, has oil holes in order to lubricate the bearings. The three gears are of the best grade of chrome nickel steel, the driving wheel and the driven gears being hardened.

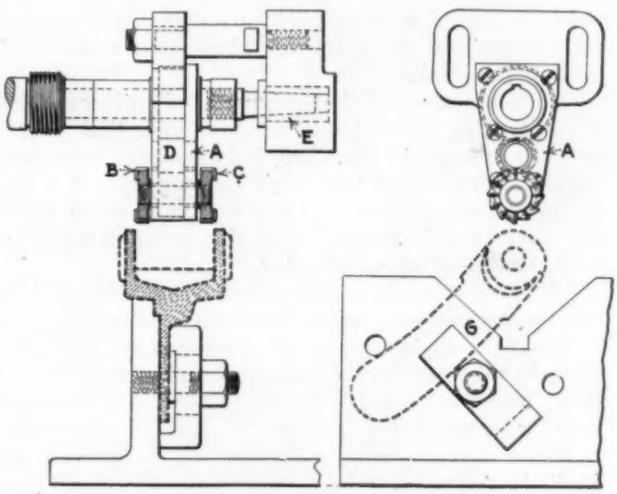
The lower gear has trunnions projecting outside the frame and cover and these trunnions are provided with left- and right-hand threads, on which the milling cutters *B* and *C* are screwed. In order to remove the cutters easily copper or bronze washers *D* are inserted between the cutters and the shoulders of the trunnions of the driven gear. These washers are also used as a means for adjusting the mills for wear, grinding, etc., keeping them always at the same width.

The illustration shows the way in which the fixture is mounted on the milling machine. The heavy lines give the fixture; the dotted lines represent parts of the machine, the work to be milled and the milling jig.

As can be seen, the fixture goes between the face of the column and the outer support. The outer end of the arbor enters the bushing *E* in the bracket in the same way as when being used in milling operations.

The front spring bracket to be milled is seen at *G* and is held in a fixture which can be used for either left- or right-hand work. The work is fed to the cutters by raising the table, using the elevating screws.

The device has proved to be very helpful but care must be taken to oil the gears well and to have them made out



SPECIAL MILLING ATTACHMENT

of the best grade of chrome steel, this being the only material that will stand the heavy pressures due to the milling.

Notwithstanding the attachment is rather small, it is very stiff and rigid and chattering is practically eliminated.

Using an Automobile Fan Bracket and Pulley as an Idler

By George A. Luers

As a roller guide to keep a grinding machine belt from running off a pulley, a local shop has found an old automobile fan pulley and bracket of advantage as a cheap means of prevention. The blades of the fan were removed, leaving the fan pulley in place on the bracket. This pulley is set against the edge of the belt on the side toward which it tends to run off. As the belt slipping off is common occurrence on some types of machines, regardless of how well aligned the pulley may be, this remedy is worth trying to correct the fault.

EDITORIALS

Reducing the Cost of Handling Freight

THERE is no doubt that high freight rates are playing their part in delaying return of business. The railroads, however, are protesting against a decrease until they can reduce the cost of operation materially and, in common with many other kinds of management, seem to feel that they should start by cutting wages.

While there are certainly cases where wages were increased beyond a reasonable point and should be reduced, we must not forget that the advance did not take place until long after other labor was receiving large increases in pay, and that one reduction has already taken place. It is also true that many of the shop rules make economical work difficult, if not impossible. Economic errors of this kind should be corrected, not in any spirit of revenge or a desire to "get even," but in order to help put business on a sound foundation.

There is, however, another method of reducing operating costs which is lost sight of in too many cases. This is by the use of modern machine equipment in the railroad shops, and there are few shops where new equipment is not needed.

It is to the honor of the designers and builders of some of our earlier railroad shop machine tools that so many of them are still in use. But it might have been better for the railroads had they worn out long ago. For, good as they were and are, it is costing far more to get out the work than it should. And this is particularly true with the higher wages of today.

With better machine equipment locomotives and cars can be repaired at a much lower cost. Locomotives can be kept in commission a much greater percentage of the time if the machine equipment enables repairs to be made promptly. And it is only when the locomotive is hauling trains that it is earning money for the roads.

The one great opportunity for better railroad earning is in better machine equipment for its shops. There is no time like the present—it should be ordered now.

Increase the Air Mail Service

THE destruction by fire of five mail planes at Chicago calls attention to the needs of the mail service for continuing its air routes. Some of these routes have already been curtailed in order to keep within the appropriations so that instead of flying daily they are restricted to four days a week in some cases.

The air mail has made a wonderful record and is looked to as the best yet attained in any country. It provides an excellent training field for commercial fliers and a chance to aid in developing commercial types of machines. It is to be regretted that the development should be so seriously curtailed.

While all agree that this is a time for curtailing unnecessary expenditures, the development of air transportation can hardly be classed under this head. With planes built especially for commercial work the cost of carrying air mail can be considerably reduced. This development will also aid commercial work of all kinds. The machines in use at present were built primarily for military work and are not as economical in performance as the newer and better commercial machines.

With such an excellent foundation as has been laid by the men of the air mail service, it is to be hoped that sufficient funds will be allotted the Post Office Department to enable it to increase, rather than to curtail, its activities. To these men is due the brightest spot in aviation in this country—may its brilliancy increase rather than be dimmed by insufficient appropriations.

Trend in Service Station Work

ONE of the notable changes in connection with the motor vehicle is the growth of real service stations and motor repair shops, in place of the earlier garage with its motor tinkerers and half-baked mechanics. The older type of motor repair shop had few tools and fewer machines. A few wrenches and files, a decrepit drilling machine and perhaps an oxy-acetylene welding outfit usually completed the equipment. And lucky was the customer whose car would run properly after he got it home.

The early service stations of the automobile dealer were not much better, except that the dealer had an added interest in keeping his cars in running order. It was Henry Ford who first stipulated that his dealers carry a stated amount of spare parts and that they have a certain minimum of machine equipment for handling repairs on Ford cars. He also inaugurated the flat rate method of charging for repairs which is now being practiced by some others, and is advocated by most service station men who have a real interest in the business. Both of these methods make for better and more satisfactory repairs and for satisfied customers.

Another development has been made possible by the education of users to the advantage of having a real motor overhauling include grinding of the cylinder bore, with new pistons to suit, and of grinding crankshafts where necessary. This has brought a better grade of mechanic into the automobile repair business. and has improved both the quality of work and the reliability of service stations.

The depression through which we are passing also has left its mark of improvement on automobile repairs. Many good mechanics formerly employed in large shops have been forced to find new fields of employment and have started little shops of their own. Being good mechanics they have improved the quality of work done, and this has been stimulated by the necessity of building a firm foundation for future business. Many of these men have brought cylinder grinding machines on time payments and are making good, their former experience and the responsibility of having a business on their hands aiding materially in urging them to get into the front rank.

All this is to the ultimate good of the user and of the motor industry. And, as elsewhere, the basis of it all is good machines and tools, without which good work cannot be acomplished.

Shop Equipment News

Heald No. 25 Automatic Ring-Grinding Machine

The Heald Machine Co., Worcester, Mass., has recently placed on the market the machine shown in Fig. 1, for grinding the sides of piston rings, ball and roller bearing races, collars, washers, gears and such work. This rotary-table surface grinding machine is intended for

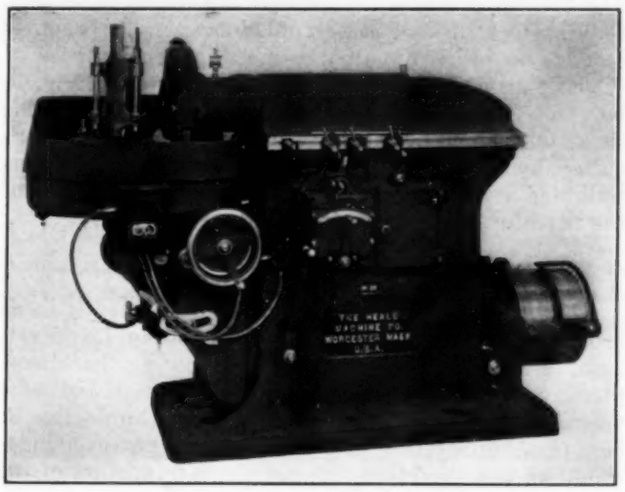


FIG. 1. HEALD NO. 25 AUTOMATIC RING-GRINDING MACHINE

large-scale production, being built heavily and with sufficient rigidity to withstand constant use. It is known as the No. 25 automatic ring-grinding machine, and can be furnished with either an 8-, 12- or 16-in. magnetic chuck.

In Fig. 2 is shown a view of the arrangement for automatically feeding the work, here automotive piston rings, to the chuck. With this arrangement, it is only necessary to load the magazine and then take away the finished product, all operations being entirely automatic. The feeding arrangement consists of a plate having five holes bushed to take rings up to 5 in. in diameter. As the plate indexes, a ring is slipped from the magazine to the center of the chuck, ground, and then slid off the chuck.

The feeding plate is indexed by a lever connected to the crank disk at the back of the machine and operated by a friction device. This disk is held stationary by means of a latch while the wheelslide is moving forward, thus grinding the ring on the chuck. As the wheelslide comes back, the latch is tripped, allowing the crank to make one revolution and indexing the feeding plate from one hole to the next. The finished ring is thus slid off the chuck and the new one put in place. There is a guard over the ring being ground, to prevent it from flying, should it break. This automatic feeding device is furnished for the 8-in. size of chuck only.

The wheelslide is a heavy casting having wide flat and V-ways provided with liberal oiling facilities. The slide is driven by means of an hydraulic system utilizing oil as the liquid. It enables the operator to instantly obtain any feed from nothing up to the maximum, the steps being made in any size desired and the changes being made smoothly and without shock. It is possible to reverse the motion of the slide at any point without shock or noise.

The spindle is made of chrome-vanadium steel, and is mounted at the grinding-wheel end in a straight, plain, adjustable bearing $2\frac{7}{8}$ in. in diameter by $6\frac{3}{4}$ in. long. Adjustment of this bearing can be readily made through an opening in the top of the wheelslide provided for that purpose. This is the only adjustment required, as the rear of the spindle is mounted on a self-aligning ball bearing. A sight-feed oiler is utilized to insure the constant flow of the oil.

The main drive shaft on the rear of the machine is mounted on roller bearings. It carries a two-step cone, so as to enable the maintaining of the proper wheel speed. The chuck spindle is mounted on ball bearings, the housing being oil tight, so that the bearings and the gears may be immersed in oil. Grit and dirt cannot work their way into the bearings. When the machine is used for general work, without the automatic feeding device, the chuck bracket can be adjusted to allow for grinding concave and convex surfaces.

The diamond is located on the chuck pan and can be adjusted so as to true the wheel to give the desired thickness of the ring. In doing this, the left-hand reversing dog is thrown up, allowing the slide to go by until the reversing lever engages a safety dog. The slide is then reversed back and forth the right distance for truing the wheel. Movement of the dogs on the

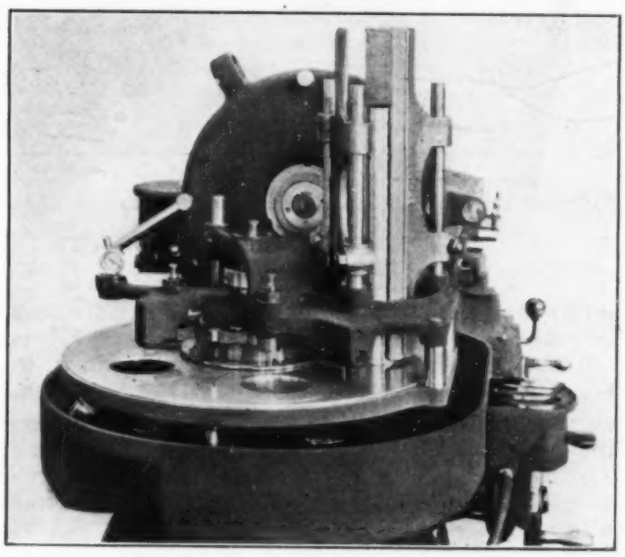


FIG. 2. AUTOMATIC FEED FOR PISTON RINGS

front of the machine controls not only the travel of the wheelslide, but also the action of the feeding device.

A disk at the rear of the machine has an electrical contact so as to furnish current for the chuck during the time that the ring is being ground. As the disk revolves, the current is automatically shut off for an instant and reversed, thereby demagnetizing the chuck

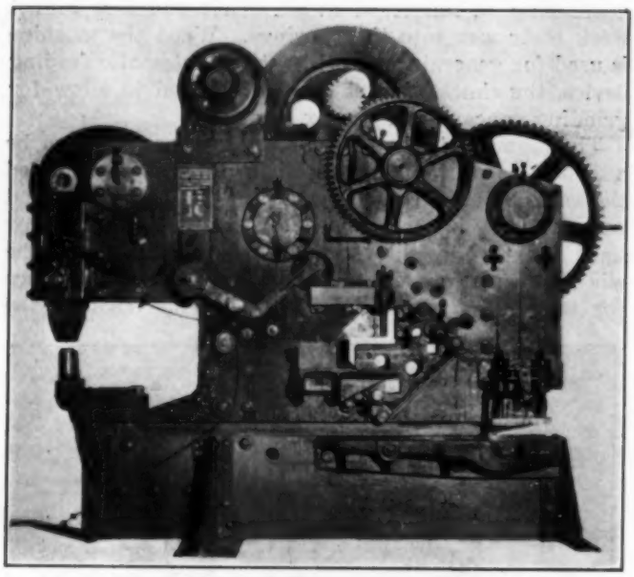
before the ring has been moved. By the time the next ring has been slid into place, the current is automatically switched on again.

A pump, tank, water guard and connections can be furnished for the supplying of water to cool the work. The distributing nozzle has a swivel joint, so that the flow can be directed to any desired point. An automatic vertical feed can be furnished, although it is not adaptable to a machine furnished with a ring-feeding device.

The machine carries a wheel 14 in. in diameter and from ¾ to 1½ in. face width. It is driven at a speed of from 850 to 1,200 r.p.m. by means of a 10 to 15-hp. motor. The chuck may be operated on either 110 or 220-volt direct current. The chuck has a vertical adjustment varying from 7¼ to 8¼ in., according to the size. The belt-driven machine requires a floor space of 90 x 40 in. The approximate weight is 4,000 pounds.

Buffalo No. 26 Universal Punch, Shear and Bar Cutter

In the accompanying illustration is shown the No. 26 universal diagonal-stroke, "armor-plate" frame, punching, shearing and bar-cutting machine recently brought



BUFFALO NO. 26 PUNCH, SHEAR AND BAR CUTTER

out by the Buffalo Forge Co., Buffalo, N. Y. The frame is guaranteed against breakage, being made of two rolled-steel plates, with cast-steel throat pieces. The high tensile strength of the plate permits of a considerable reduction in weight, when compared with cast-iron and cast-steel frames on machines of like capacity. The machine is said to be capable of taking care of every punching, shearing and bar-cutting requirement of a modern steel-fabricating shop.

The various operating points of the machine are so located that three distinct operations can be performed at one time without interference. One of the principal features is the fact that it is not necessary to tilt out of the horizontal plane the piece being cut, when beveling or mitering. This is due to inclining the shearing end at an angle, so that the shears will strike the work properly when the latter is in a horizontal plane. Even the heaviest sections can be cut in this manner without the necessity of lifting them out of the horizontal position, a procedure which saves work in handling the pieces.

Two sets of punch holders and dieblocks are furnished with the machine. Thus, means are provided for punching beams, channels, girders and columns of any size, in both the flange and the web. Holes can be punched in any part of the web without turning the section over. The gears are machine cut, and the bearings are of large proportion and bronze lined. A ring-oiled flywheel bearing is used. A 7½-hp. motor is ordinarily required to operate the machine. The machine has a punching capacity of 1¼ x ¾ in., or 1 x 1 in. It will shear ¾-in. plates, or 3½ x 1 in. flats. A special upper knife permits of shearing 8 x ⅞ in., or 2¾ x 1 in. flats. Angles up to 6 in. in size may be placed in the throat for trimming. The bar cutter has a capacity for 2¼-in. round or 2-in. square stock, 8-in. I-beams of 18-lb. weight, or other sections in proportion to the cross-sectional area.

The punch has a throat 24 in. in depth and 19 in. in height. It is engaged by a handle or a treadle. The shear is engaged by means of a jaw-clutch, and the bar cutter by shifting the ram by means of a counterweighted lever. The universality and adaptability of the machine are its principal features.

Bennett "Detectorod"

A device, called a "detectorod," has recently been brought out by the Bennett Metal Treating Co., Hartford, Conn., for the purpose of determining the atmospheric conditions in steel-treating furnaces. It indicates when a furnace that is to be used for hardening or heat-treating steel is in a reducing, or non-oxydizing, condition and therefore safe for the introduction of the work, without danger of scaling it. Its operation is based on the fact that a hydro-carbon gas is, in itself, non-inflammable.

The rod is of steel, about ¼ in. in diameter, and has a hole 0.025 in. in diameter passing lengthwise through it. For a short distance near the outer end of the rod the hole is enlarged to form a chamber, and the end of the rod is sealed by welding. A transverse hole of 0.030 in. diameter forms the outlet. The handle is in two parts, one part forming a reservoir and the other part a pneumatic pump. The reservoir is filled with kerosene oil, and air pressure is raised by a stroke or two of the pump.

To determine when a furnace is in a condition safe for the work, the rod is introduced, so that the end will reach as nearly as possible to the place to be occupied by the work. A pressure of the thumb upon the conveniently placed button of a needle valve, shown in the accompanying illustration, releases a small quantity of

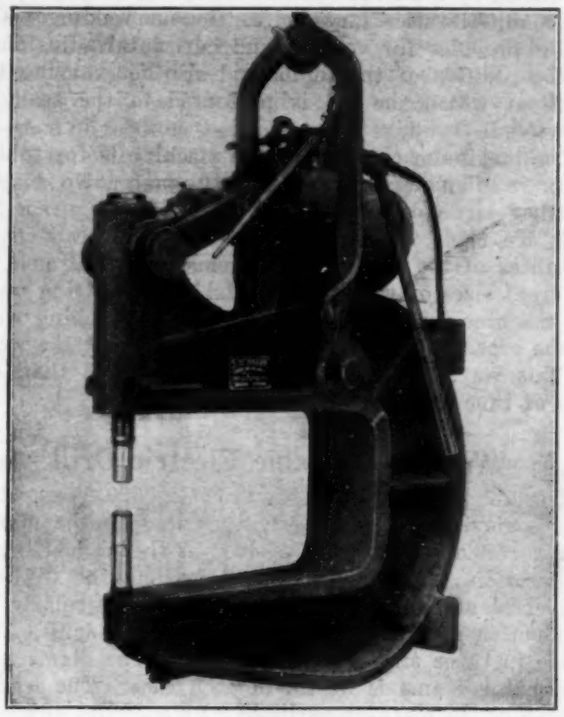
BENNETT "DETECTOROD"

the oil, to flow through the small hole to the chamber at the end of the rod, where it is immediately vaporized by the heat and issues from the side outlet as a hydrocarbon gas.

If the jet of gas ignites, it indicates that too much oxygen is present in the furnace, and the air and fuel supply valves must be regulated, until repeated trials with the detectorod give no flare at the end when the button is pressed.

Southwark Pneumatic Riveter

The Southwark Foundry and Machine Co., Philadelphia, Pa., has recently placed on the market a line of pneumatic riveters of the type shown in the accompanying illustration. The machine is of the compression yoke type, and employs a toggle action to impart the desired movement to the die. When the air is turned into the cylinder, the die is caused to move rapidly during the first part of the stroke of the piston. This permits of bringing the die up to the rivet. The latter part of the piston travel produces a comparatively small movement of the die. Since the relation between the movement of the two members is practically constant during the last half of the stroke, it is unnecessary to drive the rivet at the very end of the travel of the die and piston. The position of the die is set for the work being performed, so that the rivet is headed when the piston has moved through three-fourths of its stroke. Consequently, sufficient travel of the die at full pressure on either side of this position is available to take care of variations in the length of the rivet, the thickness of the plates or dimensions of the holes. This eliminates the necessity for further adjustment of the die screw.



SOUTHWARK PNEUMATIC RIVETER

The operating valve is of the plain slide type, having but one wick packing on the stem end and a removable valve seat to enable regrinding. The pull-back is accomplished by using the line pressure, the air being admitted back of the piston. Two separate pressures can be obtained on the die by simply turning a plug cock in the valve plate. This admits air at full pressure on the pull-back area of the piston, thus reducing the resultant pressure on the piston, and consequently on the die. Pressure regulating valves and auxiliary storage tanks are not used.

The riveter frames are steel castings of I-section. The portable machines are provided with suspension bails. When machines have a reach above 36 in., feet are provided for mounting in a stationary position. The simplicity of the mechanism should be noted, since but one thrust bearing and four bushings are required.

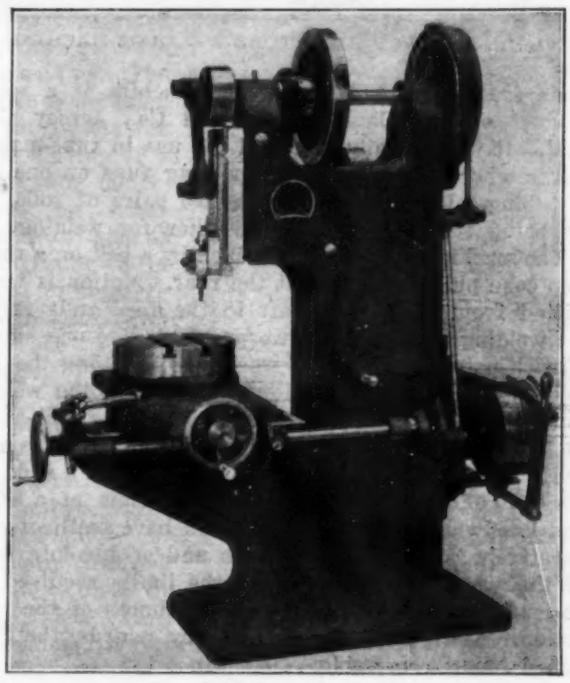
The machine is made in the following capacities: 10, 17½, 30, 50, 75, 100, 125 and 150 tons. The cylinder diameters vary from 7¼ to 20¾ in. The smallest size of the machine has a reach of 4 in. and a gap of 10 in. The largest has a reach of 21 ft. 6 in., and a gap of 24 in. The specifications and the equipment of the machine can, of course, be varied to suit the conditions peculiar to the installation.

Peters-Bossert Die Slotting Machine

The accompanying illustration shows a vertical slotting machine recently placed on the market by the Peters-Bossert Co., 617 East Pearl St., Cincinnati, Ohio. The machine is intended especially for work in making dies and punches of either regular or irregular shape. It is fitted with a special mechanism for producing a curved relief on the die.

The ram slides in vertical ways, is fitted with a gib, and driven by means of a crank on the main shaft. The crankpin on the driving shaft can be adjusted in its position on the disk, so as to vary the length of stroke from zero up to 4 in. The ram is slotted and fitted with a pin, the position of which can be adjusted so as to change the height of the ram to suit the work.

The ways carrying the ram are hinged at the upper end. The lower end is connected by means of a toggle joint arrangement to an eccentric on the main shaft. In this way, the ram and slide can be moved forward while on the down stroke, so as to give relief to the die. Due to the construction, the tool moves in an arc, so that after the tool has entered the die, it is possible to cut a curved relief for the punchings. On the up stroke, the tool automatically clears the work. The magnitude of the lateral motion can be varied to suit the requirements.



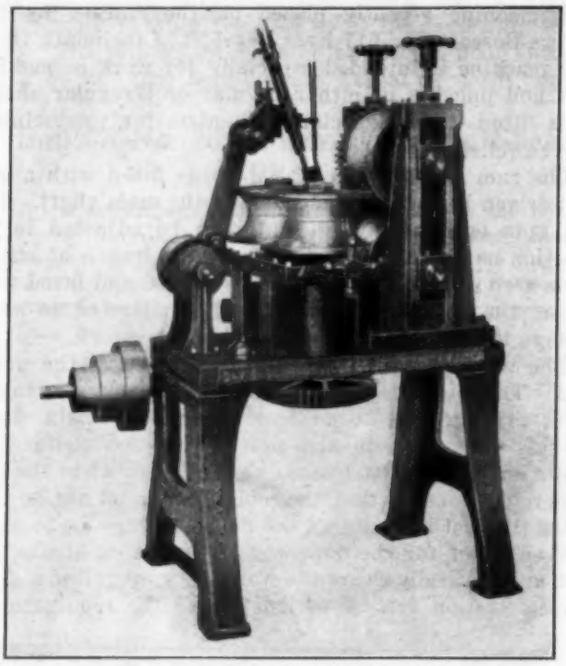
PETERS-BOSSERT SLOTTING MACHINE

By simply using a pull pin, the cam mechanism can be disengaged, so as to permit of taking straight vertical cuts on the work.

The machine is provided with cross, longitudinal and circular hand feeds, each operated by means of a separate screw and handwheel. Power feeds may be furnished when desired. A variable-speed gear box mounted inside the frame gives three changes of speed, being operated by means of a shifting lever. The machine is ordinarily driven by belt on tight and loose pulleys at the back of the base.

Davis-Bournonville Tube-Welding Machine

The accompanying illustration shows an oxy-acetylene welding machine intended particularly for the large-scale production of tubing having a large diameter and



DAVIS-BOURNONVILLE TUBE-WELDING MACHINE

made from thin-gage steel. The machine is a recent product of the Davis-Bournonville Co., Jersey City, N. J. It is especially intended for use in tube-making plants where it will be used for long runs on one size of tubing. It is equipped with two pairs of rolls, one set being for feeding, and the other for welding.

The machine is ordinarily driven by a belt on a three-step cone pulley mounted at the rear. Motion is transmitted from the drive shaft to the feed rolls and to the welding rolls through worm gearing to one spindle of each pair of rolls. The wormwheel driving the feed rolls is in a vertical position, and that on the welding rolls in a horizontal position. The welding roll at the back is fixed in place, while the one in front is relatively adjustable, its spindle bearing being in a slide, the position of which is controlled by means of a screw and handwheel. The mating gears have teeth of comparatively large diametral pitch and of involute form, so that the adjustment within the limits required can be made without affecting the smoothness of the tooth action. The gears are protected by guards, the front guard being removable.

The upper and the lower feed rolls are geared together, adjustment being made in this case also by moving one of the rolls and its mating gear, sufficient latitude in the meshing of the gears being available for the slight adjustment needed. The welding rolls are made with annular depressions on the top for the holding of cooling water, and a circulating system can be attached if required.

A welding torch of the multiple-jet, water-cooled type is employed. Both the tip and the barrel of the torch are cooled by the circulation of water, thus maintaining the conditions necessary for continuous welding. The holder provides for vertical and horizontal adjustment of the position of the torch, and also for varying the angle at which the tip is presented to the seam to be welded.

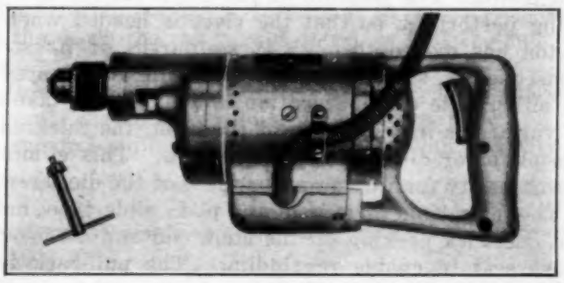
The maximum capacity of the machine is for tubing 6 in. in diameter and of No. 10 gage. No matter whether large or small diameter tubes are used, the rolls are made the same size overall, the mean center distances of the mating gears remaining the same for different sizes of work. This enables the setting up of the machine for any diameter and gage of tubing within the capacity, by using rolls grooved to suit the work. In this way, welding can be done on more than one size of tube with any given machine.

"Willey" Portable Electric Drill

The James Clark, Jr., Electric Co., 520 West Main St., Louisville, Ky., has recently placed on the market the portable electric drill shown in the accompanying illustration. The device, designated as the "Willey" universal automatic drill, is intended particularly for production work with small sizes of twist drills. It is made in three sizes, $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{5}{16}$ in. The diameter of the motor frame is $3\frac{1}{4}$ in. in each case. The lengths overall of the machine equipped with a Jacobs chuck are $11\frac{3}{4}$, $12\frac{1}{4}$ and $13\frac{1}{4}$ in., respectively. The weights are $6\frac{1}{2}$, 7 and $7\frac{3}{4}$ pounds.

The switch for operating the motor is incorporated in the handle, being in such a position that it is closed when the operator grips the handle. As soon as the operator releases his grip, the switch automatically disconnects. In this way, the current is always turned off when the drill is not actually being used. Although the switch is operated at the handle, there are no wire connections made there, all connections being on the inside of the motor frame or body.

The motor may be wound for either 110 or 220-volt alternating, single-phase current of 60 cycles or less,



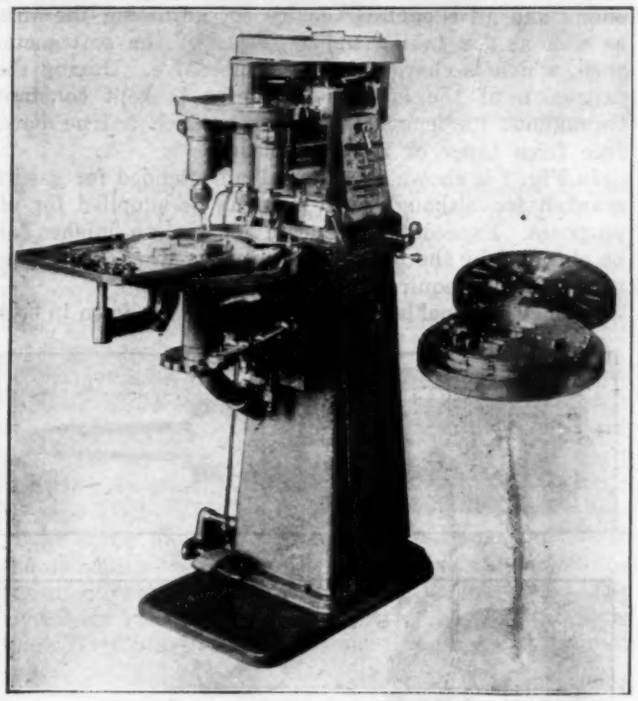
"WILLEY" UA PORTABLE ELECTRIC DRILL

and is capable of operation on direct current of the same voltage as the alternating.

The device is smooth in contour. It is stated to be compact, well-balanced, light in weight and well finished. It has no projecting corners to interfere with close-corner drilling. It is made up of three sub-assemblies, the spindle with the gears, the motor body, and the handle with the automatic switch. It is provided with 15 ft. of electrical cord.

Anderson Dial-Feed Multiple-Spindle Tapping Machine

The Anderson Die Machine Co., Bridgeport, Conn., has recently developed and placed on the market the tapping machine shown in the accompanying illustration. The machine is equipped with three spindles, and is intended for high production when tapping small brass and steel pieces, such as those used in electrical appliances. The chief feature of the machine is in the method of feeding the work to the spindles, a dial being used in which stations are provided for holding the works. The device is similar in its method of operation



ANDERSON DIAL-FEED TAPPING MACHINE

to dial-feeding arrangements employed on small punch presses.

Clutches are not used for reversing the spindles, which are driven in opposite directions by means of a toothed segment and train of gears. The segment is controlled by a crank disk at the upper end of the vertical shaft extending through the central part of the main frame. To this vertical shaft are secured the cams for indexing the dial and for locking it in its proper position. The ratchet which controls the dial is regularly furnished with eighteen teeth, being used when dials having eighteen openings are employed.

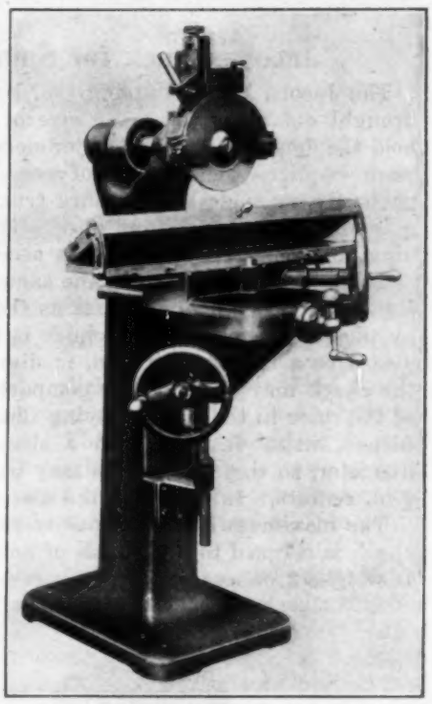
The dial is made of relatively thin material and has openings to fit the particular pieces to be tapped. Any piece with one, two or three holes can be tapped at one passing; on account of the construction of the chuck spindles, three taps of entirely different lead can be used at the same time.

The two tap spindles at each side are adjustable, so that any combination or location of the three holes can be obtained. The dials are made to suit the primary or central spindle, which is not adjustable in position. They are located and rotated to bring one hole in register with the fixed spindle; and then the two auxiliary spindles are adjusted to suit the location of the two adjacent holes. The machine is equipped with ball bearings on high-speed shafts.

This machine when holding from No. 4 to No. 10 taps is ordinarily run at a speed of fifty-six strokes per minute. Either one, two or three holes can be tapped in each piece. On pieces where only one hole is tapped, it is possible to double the production by doubling the number of slots in the dial, and by adjusting one of the auxiliary spindles, to tap the additional hole. This would give a production of approximately 112 pieces per minute on single-hole tapping. The machine can be used to advantage in tapping nuts and small pieces containing a number of holes to be tapped, as for instance spindles for door knobs, which, as a rule, have three holes to be tapped in each end of the spindle. A cam and slide can be furnished to work in conjunction with the dial, so that round pieces can be tapped. The form of drive employed permits of timing the various movements very accurately, and without any danger of this timing being upset. The production can be thus accurately scheduled and determined.

Wilmarth & Morman Surface-Grinding Machine With Tilting Table

The Wilmarth & Morman Co., Grand Rapids, Mich., has recently equipped its No. 1 hand-feed, surface-grinding machine with a tilting table, in addition to the plain and swivel-table styles. The arrangement is particularly adapted to grinding small work on a magnetic chuck when surfaces at angles are required to be finished. Instead of blocking up one edge of the chuck, it is securely bolted to the table, which is then tilted to the required degree. By this means, the work can be held rigidly, so as to produce accurate results. The table is provided with T-slots for the holding of a magnetic chuck, vise or other fixtures, and it is graduated in degrees so as to facilitate setting to the proper angle. The truing device is located on the wheel hood, and it dresses the grinding wheel horizontally or at any desired angle without the necessity of removing the work from the table. If desired, a radial truing device which operates from the table can also be furnished.

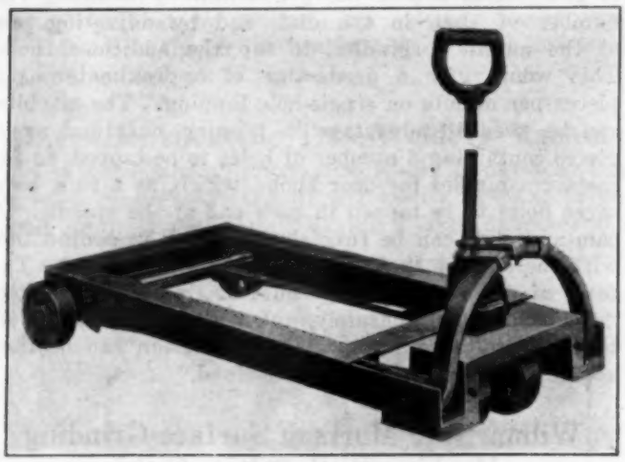


WILMARTH & MORMAN NO. 1 TILTING-TABLE GRINDING MACHINE

The machine is intended for accurate work both in the toolroom and on production in the shop. It is stated to have a considerable field of application in the handling of small parts, and a battery of them may in some circumstances work more efficiently than larger automatic machines.

Western Lift Truck

The Western Tool and Manufacturing Co., Springfield, Ohio, has recently placed on the market the hand-operated lift truck shown in the accompanying illus-



WESTERN HAND LIFT TRUCK

tration. The truck is made of iron and steel. With it one man can raise a load of 2,000 lb., the lift of the platform being 1½ in. The platform is ordinarily 23 x 38 in. in size, and 7½ in. above the floor when raised.

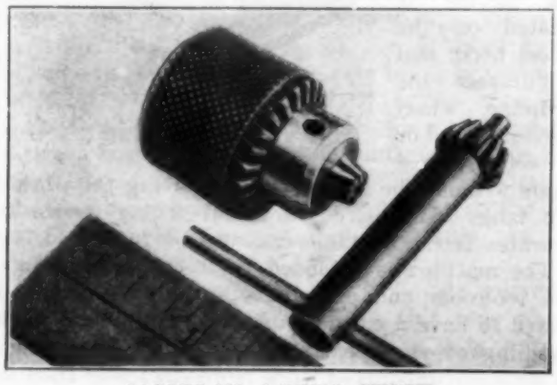
The truck can be turned in its own length, the front wheels swiveling about a ball thrust bearing. Roller bearings are employed on all wheels.

Jacobs Chuck for Small Drills

The Jacobs Manufacturing Co., Hartford, Conn., has brought out a special No. 0 size of its drill chuck, to hold the small drills used by jewelers and others whose work requires the drilling of very small holes. The parts are so made as to insure true running and even gripping of the drills, and also to secure accurate running balance at the high speeds necessary.

Though constructed upon the same principle and having the same number of parts as the larger sizes made by the same company, this chuck is but 1¼ in. long and measures a trifle under ⅜ in. in diameter. The size of the chuck may be gaged by comparing it with the size of the ruler in the accompanying illustration. It is furnished, when desired, with a sleeve of even smaller diameter, so that the chucks may be run in multiple at ¾-in. centers. In this case the sleeve is not knurled.

The maximum holding capacity is ⅛ in., although the chuck is claimed to be capable of holding a hair tightly. It weighs 2 ounces.



JACOBS NO. 0 DRILL CHUCK

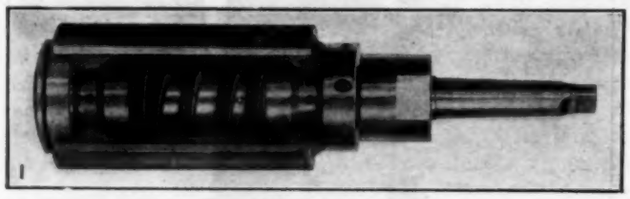
R. & C. Lapping Tools

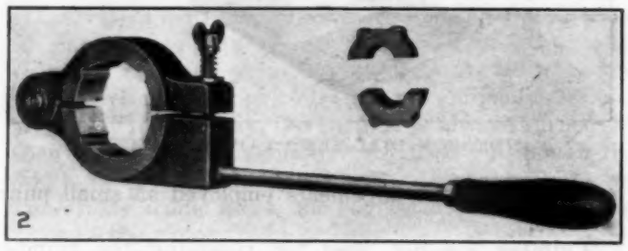
The R. & C. Lap Co., Davenport, Iowa, has recently placed on the market a line of standardized laps having interchangeable and replaceable shells. The laps are intended for use not only in tool making, but on production work in the shop, so as to enable both rapid and very accurate work. The abrasive shells are supplied in two grades, depending upon the speed of cutting and the type of the work. The laps are made for both external and internal use in sizes from ¼ in. up.

In Fig. 1 is shown the cylinder lapping tool, one section or shell of the lap being removed so as to show the interior construction. The lap consists of a floating shank and an expanding device for adjusting the size, as well as for taking up the wear of the soft metal shell, which is charged with the abrasive. During the expansion of the lap, the diameter is kept constant throughout its length, so as to produce a true bore, free from taper or a "bell-mouth."

In Fig. 2 is shown an external lap intended for use on crankshafts, although such laps can be supplied for all purposes. Exceedingly accurate and smooth finishes can be obtained by the use of the lap, even when very large production is required.

A small internal lap for tool-room use is shown in both





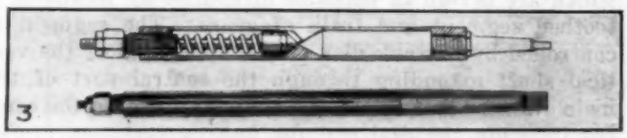
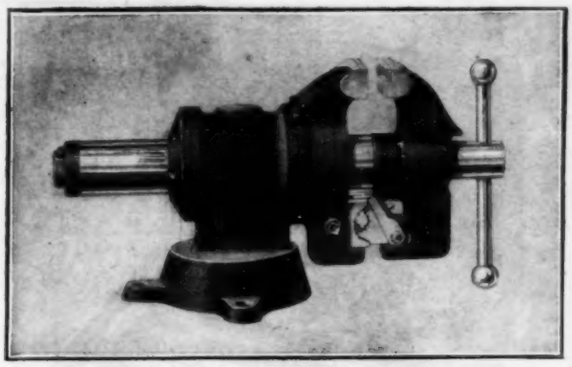


FIG. 1. R. & C. CYLINDER LAP. FIG. 2. EXTERNAL LAP. FIG. 3. SMALL INTERNAL LAP

the sectional and the full view in Fig. 3. The lap is stated to be made of the most suitable materials for the purpose. Due to its construction, a slight contraction is permitted, in case the hole is rather small, thus preventing sticking. However, the laps cannot expand beyond the original micrometer setting, thus assuring accurate work. As the lap is expanded, it maintains its true cylindrical form. By means of the expansion feature, the life of the tool is greatly increased. The lap is made with a standard shank, and may be fitted in a lathe or drill press, or operated by hand. It is expanded to the required size by means of the adjusting nut, and then fastened in this position by means of a lock-nut. The abrasive is then applied and the work is lapped in the usual way.

Atlas "Nutyp" Vise

On page 160, Vol. 55, of the *American Machinist*, was described a vise made by the Fulton Machine and Vise Co., Lowville, N. Y., under the name of the



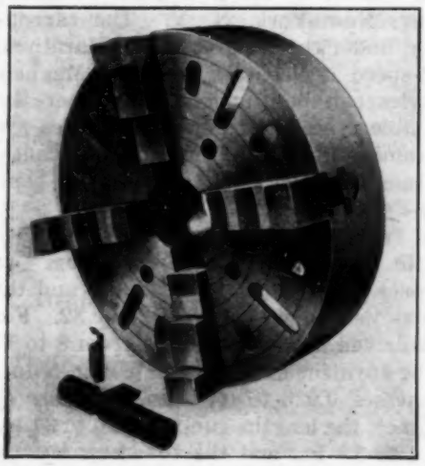
ATLAS "NUTYP" VISE

"F. & R. Combination Special Vise," and sold by the Boker Cutlery and Hardware Co., New York, N. Y. The vise is now made by the Atlas Vise Co., Inc., Lowville, N. Y. The accompanying illustration shows the "Nutyp" vise, which is fitted with a swiveling base, although the vise previously mentioned had only a plain clamping base.

The jaws of the vise are 3 in. wide and have an opening of 3½ in. On the opposite side of the screw from the plain jaws is mounted a pair of pipe jaws having a capacity of 1⅜ in. diameter. In addition, a shearing device for cutting stock ¼ in. in diameter is incorporated. The jaws can be swung about the axis of the screw and locked in any desired position. With the swiveling-base type, the whole vise can be swung about a vertical axis and locked in position. The swiveling vise has a net weight of 40 lb. It is said to be particularly adapted to use in garages and repair shops.

Cushman Steel-Bodied Lathe Chuck

The Cushman Chuck Co., Hartford, Conn., has recently brought out an improved design of its lathe chuck, and is making it in all sizes from 10 to 30 in. The body is of cast steel and the jaws are pack-hardened and ground. All parts are finished to master gages and are interchangeable. The screws are of chrome-nickel steel, surface hardened, and have a greater length of bearing than in the former Cushman chucks. The thrust bearing is a special feature of this type of chuck. It is made in two parts and completely encircles the screw at a point about midway of the length of the latter. A screw and both parts of the thrust bearing are shown separately in the accompanying illustration.



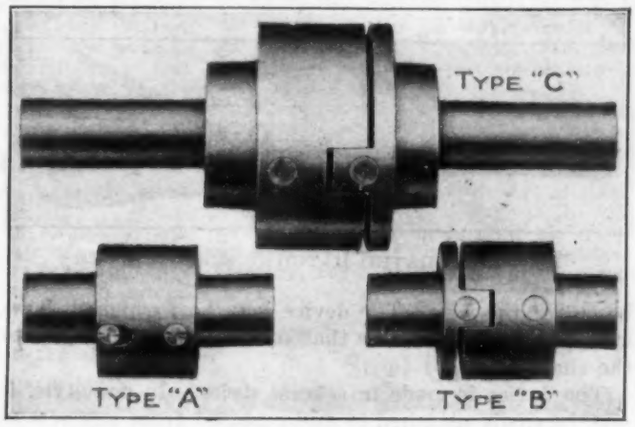
CUSHMAN TYPE-214 STEEL-BODIED CHUCK

The stem of the thrust bearing is round when the two parts are placed together and, in assembling, it is driven into a round hole in the chuck body. It is therefore self aligning and, being symmetrical, cannot be put in a wrong position. When in place it holds the screw to the chuck body whether the jaws are in place or not, thus allowing no opportunity for dirt or chips to work under the screw threads when changing or reversing the jaws. It also provides a firm bearing against thrust in either direction. The net weight of the chuck ranges from 64 to 452 lb., according to the size.

Bartlett Flexible Shaft Couplings

C. H. Breaker, 4226 Broadway, Indianapolis, Ind., has recently placed on the market the Bartlett flexible shaft coupling. There is no bending of material or looseness of construction in the coupling, all parts fitting closely. The flexibility is derived from a turning motion around hardened steel pins, and also from a sliding motion taking place in a tongue-and-groove construction. The power loss due to friction is stated to be very slight, and the absence of bending strains reduces wear.

The coupling maintains a uniform angular velocity ratio between the two shafts, no matter what the degree of angular or parallel misalignment. End float is also allowed, an important consideration for alternating-current installations. The machine is simple in construction, and can be easily installed, no screws or bolts being used in the parts. To assemble or disassemble, the two sliding members are merely pushed into or out of engagement.



BARTLETT FLEXIBLE SHAFT COUPLINGS

The parts are made of machine steel and heat-treated. It is stated that the coupling is capable of carrying the full allowable load that the shafts can transmit. By a slight change in the construction, positive transmission wih a uniform angular velocity ratio can be obtained between shafts set at any angle to each other up to 90 deg. In such installations, the coupling operates satisfactorily, even though the shaft ends are not in the perfect alignment which is necessary when bevel gears are used.

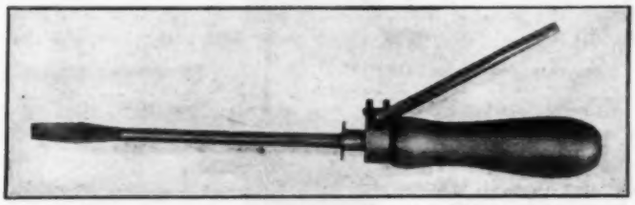
The coupling is made in three types, shown in the accompanying illustration. The Type A has one collar pinned directly to one shaft end. A hardened pin in the other shaft end slides in a slot in this collar. The Type B coupling has a collar or ring pinned to each shaft end, the connection being made between the two

parts by means of a groove and slot. The Type C coupling has a hub keyed to the end of each shaft. Bearing pins fasten the outside rings to the hubs, the rings being engaged with each other by tongue and groove construction. The first two types mentioned have the advantage of simplicity, compactness and low price, being used especially where the duty is not severe. The Type C coupling is made for heavy service, high torque and high speed.

Roberts Lever-Operated Ratchet Screwdriver

William Roberts, 457 Main St., Springfield, Mass., has recently placed on the market a lever-operated ratchet screwdriver, the tool being made by the Cogswell Manufacturing Co., also of Springfield, Mass. By means of the device, considerable torque may be applied in the turning of slotted-head screws. It is intended to replace the use of a wrench when turning a screwdriver.

The auxiliary handle, normally at right-angles to the shank, has a cam-shaped bearing against the shank of the screwdriver, thus acting as a ratchet and binding the shank when tightening the screw. It can be operated in either direction. The handle shown is so made that by turning it end for end after using it to drive a screw, it can be folded against the screwdriver itself so as to



LEVER-OPERATED RATCHET SCREWDRIVER

be out of the way. The device may be furnished, however, with a plain handle that remains at right-angles to the shank.

The device is made in several styles. In one style, it may be easily attached to and removed from any screwdriver of suitable size. A split taper collet is first placed on the shank and then clamped by means of a tapered nut screwed down on it. The ratchet and lever fit on a collar on the collet, so that the whole screwdriver may be turned by means of the handle. The device may also be furnished with a hollow head for fitting bolt and socket-wrench heads. Its use permits the turning of the screwdriver with considerable force, and when space is limited with only a small swing of the lever.

H & G Socket and Ratchet Wrench Set

A set of socket wrenches provided with a ratchet has been put on the market by the Eastern Machine Screw Corporation, of New Haven, Conn. The set is intended to give convenience in handling, as well as flexibility of operation. It is packed in a wooden box in which a place is provided for each part, so that the absence of any part may be readily noticed.

Ten sockets for hexagon nuts from $\frac{7}{16}$ to 1 in. in size are provided. The hexagon hole in each socket is made by drilling a hole with a diameter equal to the distance across the corners of the nut at the maximum point. The rim is then pressed in to form the hexagon, during which process the metal is condensed and toughened. A hexagon head is provided on the top for turning the socket, all of the wrench parts fitting over this head. The sockets are heat-treated and hardened.

An adjustable T-handle is provided. The crossbar

H & G SOCKET WRENCH SET

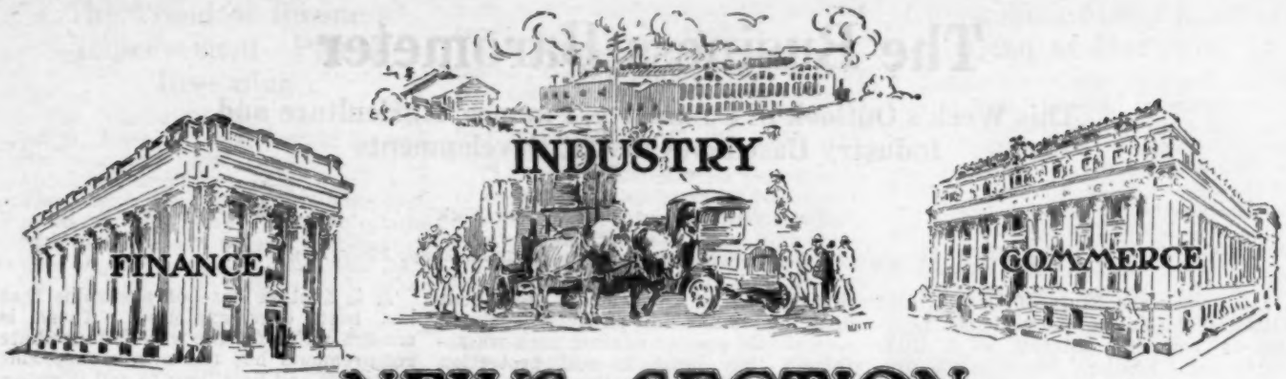
in it can be used in a central position for fast work or slid to one side to obtain greater leverage. The ratchet is compact, and may be made either right- or left-hand by simply raising and reversing the position of a ball-headed pin. An extension piece is provided to be used between the T-handle and the socket, to turn nuts otherwise difficult to reach or to bring the handle to a more favorable position. A universal joint is furnished for turning nuts located at angles to the wrench handle. The parts of the joint are milled from bar stock. Two screwdrivers are provided to fit the attachments.

A drop-forged box wrench is included in the set primarily to permit of getting at nuts in connection with the sockets where the limited head room over the nuts will not permit the use of the other tools. Each outside part of the wrench attachments has a spring-steel split screw, so as to provide the proper amount of friction to hold the parts together while in use.

Mayhew Hacksaw Blades

A complete line of blades for hacksaws has recently been placed on the market by Mayhew Steel Products, Inc., 291 Broadway, New York, N. Y. The carbon-steel blades are sold under the trade name of Marathon, while for the high-speed-steel blades the name Mayhew is used. Both styles can be furnished in either the all-hard or the flexible type. The Marathon blades are for use in hand frames only, while the Mayhew blades, which are made from tungsten steel, are for both hand frames and power-driven machines.

For use in hand frames, the blades can be furnished in lengths from 8 to 18 in. The widths vary from $\frac{1}{2}$ to $\frac{3}{4}$ in., the thicknesses from 0.025 to 0.032 in., and the number of teeth may be either 14, 16, 18, 24 or 32. For use on light power-driven machines, blades from 8 to 17 in. in length can be furnished, the widths being $\frac{5}{8}$ to 1 in., and the thicknesses 0.028 to 0.032 in. For use on heavy power machines, the lengths run from 10 to 24 in., the widths from $\frac{3}{4}$ to $1\frac{1}{2}$ in., and the thicknesses from 0.049 to 0.065 in., the number of teeth per inch varying from 7 to 18, depending on the size of the blades.



NEWS SECTION

U. S. Chamber to Consider Railroad Situation

The railroad situation and what should be done about it from a business standpoint, will be considered at a meeting of the national council of the Chamber of Commerce of the United States, to be held in Washington, Feb. 8 and 9. The council is made up of one representative each from the 1,400 business organizations within the membership of the chamber.

The chamber's railroad committee, which has just concluded a meeting in Washington at which the situation was gone over, is of the opinion that the Transportation Act can be left untouched and at the same time there can be worked out a constructive plan which will help solve the problem. It will prepare a report to be presented at the council meeting, suggesting a program for dealing with the situation. This report when completed will propose means for keeping the national interest in adequate transportation foremost in all measures which may be taken in relation to transportation.

British Industries Fair Next Month

The British Industries Fair, the greatest trade fair in Europe, will be held concurrently in London and Birmingham from Feb. 27 to March. 10, each section of the fair covering different fields of industry.

The fair, which is Great Britain's annual display of her manufactures and industries, is especially organized to bring buyer and seller together and is a stimulus to competition, as the principal manufacturers exhibit side by side. An important section of the fair will be devoted to general machinery of all descriptions.

Further information may be obtained from the British Consulate-General at Chicago, or any British Consular Officer.

Canadian Marking Regulations Changed

The Department of Customs and Excise, of Canada, has changed some of the rulings in connection with the marking of goods with the name of the country of origin. The changes are too extensive to enumerate or describe here, but those vitally interested in the matter may obtain full particulars from the department headquarters at Ottawa.

Bullard Co. To Make Motorcycles

The *Bridgeport Post* announces that the Bullard Machine Tool Co., of Bridgeport, Conn., has begun the manufacture of motorcycles on a quantity production basis. The machine is a four-cylinder equipped with side-car. All parts are to be made and assembled at the Bullard plant, but the company, it is understood, is not engaged in the sales or distribution of the product. The surplus capacity of the Bullard plant is being utilized for the purpose and the new work will not in any way interfere with the manufacture of the regular product.

Exports of Industrial Machinery in 1921

Exports of American industrial machinery show an increase of something like 170 per cent in value in 1921 over 1913, according to the Industrial Machinery Division of the Department of Commerce. The figures are contained in a special review of the machinery export situation.

The impression that our foreign trade has collapsed is not justified in so far as exports of machinery are concerned, says the review in pointing out that exports of such machinery for the first eleven months of 1921 were valued at $238,007,585, against $92,312,457 for all of 1913. While official figures for the calendar year 1921 are not yet available, $250,000,000 is a conservative estimate of the total value of the trade during the year.

Automobile Production

In analyzing business conditions as of Jan. 1, the Federal Reserve Board makes the following reference to the automobile industry:

"Manufacturers are awaiting the results of the automobile shows before determining their manufacturing schedules for the coming year. November production is apparently less than for the previous months, manufacturers having 63 per cent of the passenger car output of District No. 7 (Chicago) producing 69,125 cars in November, as compared with 84,913 cars in October. November carload shipments were 14,061, as compared with 17,676 carloads in October, while drive-aways decreased from 12,808 to 10,509 machines. Factory sales in November are, however, stated to have increased over October.

Marvin Heads U. S. Tariff Commission

A statement issued at the White House announces that the President has designated Thomas O. Marvin, of Massachusetts, to be chairman of the United States Tariff Commission for the year beginning Jan. 15, 1922, and William S. Culbertson, of Kansas, to be vice-chairman of the commission for the same period.

Mr. Marvin has been a member of the commission since his appointment by President Harding in March, 1921. Mr. Marvin succeeds to the chairmanship held until this time by Thomas Walker Page, of Virginia. Mr. Page will remain as a member of the commission.

Mr. Culbertson has been a member of the commission since its organization under the provisions of the Act of Sept. 8, 1916. His first term expired in 1921 and he was reappointed, first by President Wilson and later by President Harding, for the term ending in 1932.

Jones & Laughlin To Build Steel Plant

The report from Chicago that the Jones & Laughlin Steel Co. of Pittsburgh, is negotiating for approximately 1,000 acres of land in the Chicago steel-making district to be used as a site for a steel works, has been confirmed by an official of the steel company.

The company is negotiating for a large parcel of land in Hammond, Lake County, Indiana, to be used as the future site for blast furnaces and steel works. The conclusion of the transaction is contingent upon certain things being done by the interests in Hammond, which, if satisfactorily performed, will result in the land being acquired for the purpose stated.

Screw Thread Commission Will Stay

In view of any lack of objection to the continuance of the term of the National Screw Thread Commission, it is probable that no hearings will be held on this bill by the Senate Committee on Manufactures. The Committee will discuss the bill, which has already been favorably reported in the House of Representatives, at its next meeting.

The sentiment of the committee is said to be favorable to the bill and it is expected to pass.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Last week the State of Oregon sold $10,000,000 soldiers' bonus bonds bearing 4½ per cent interest at a little above par. Soldiers' bonus bonds previously sold by other states total $169,000,000. Many of the remaining states that have not yet sold bonus bonds have actually authorized or contemplate issues of from $5,000,000 to $45,000,000.

The news from Washington indicates that before the end of the present session Congress will find a way to distribute a bonus of from one to four billions among the soldiers. This is not written in the hope of preventing such prodigality but to call attention to its probable consequences. Most of this money will be spent as soon as it is received by those for whom it is intended.

To it will be added the enormous sum realized from the other state securities and the municipal, county, road, drainage and irrigation bonds that have been marketed of late. Their aggregate is unknown but it runs into the billions. At the National Roads Congress held in Chicago last week J. E. Pennypacker, secretary of the National Asphalt Association estimated that "nearly $1,250,000,000 is available for road building this year from Federal, State and County appropriations, tax levies and bond issues and that more than 700,000 men will be employed in road construction and patrol work" while this money is being spent.

The railroads and other corporations who have recently been able to sell bonds will also spend most of the new money raised in construction work in which labor will be employed. The Union Pacific ordered $10,000,000 worth of new equipment the other day. The Burlington is arranging for a bond issue of $30,000,000 the proceeds of which are to be spent for additions and improvements and numberless other borrowers are taking advantage of the present money market to supply themselves with funds that will sooner or later be disbursed in wages.

False Prosperity

Some may call this inflation and condemn it. They will probably be right in so far as the bonus gratuities are concerned, but it is futile to rail at what we cannot prevent. It is a condition and not a theory that confronts us and the fact is that during the next twelve months an unusual amount of "easy" money will be put into circulation. It promises to be a year of expansion as 1921 was one of contraction and since expansion generally fosters speculation, advancing prices with what we call prosperity now seem indubitably indicated. I say "what we call prosperity" for it is doubtful whether real prosperity can be created by taxing one class of the people that the Government may distribute largess among another class but that is what the politicians seem bent upon and while all patriotic business men should protest against such wastefulness they must in self protection be opportunists in dealing with conditions that must be endured because they can't be cured.

Another development that must be reckoned with is the possibility that a new political party may shortly come into existence. After the Civil War we had the Greenback Party. It grew strong enough to induce the eminent philanthropist, Peter Cooper, to accept its nomination for the Presidency in 1876 and at the Congressional elections of 1878 it polled over a million votes and elected fourteen Congressmen who held for a time the balance of power in the House.

Strength of Farmer Party

The strength of what is called the "Agricultural Bloc" in Congress suggests that this bit of history may be in some respects repeated and that a well organized agrarian party may be born of the travail of the post war period. If this shall come to pass the probability is that the credit resources of the nation will be somewhat lavishly used in the interest of agriculture, for the successful insistence of the Senate "Bloc" upon the enlargement of the Federal Reserve Board so that a farmer can be added to it is not, to say the least, suggestive of further deflation. The protests of the bankers against the recognition thus accorded agriculture upon the ground that it is "class legislation" hardly seem consistent with the fact that the present law expressly provides that at least two members of the Federal Reserve Board shall be men of banking experience.

The Agricultural Conference convened by the President to meet in Washington Monday is another evidence, as it is a recognition, of the farmer's political self consciousness and power.

These quasi political considerations are dealt with at length this week because their economic importance is great and is being gradually recognized. On the Stock Exchange where it would naturally be first appreciated the feeling has been almost buoyant. One group of securities after another has advanced. The improvement in each case is attributed to a different reason but underlying the upward tendency is a recognition of the ease with which money can be and is being borrowed. As the buying has turned to stocks, bonds have been somewhat quieter but the demand is still equal to the offerings.

The commodity markets are not, however, as yet affected. The single exception is sugar, which is slightly higher and growing firmer despite the widely exploited surplus. Cotton has been more resilient than it was last week and has recovered some of the decline recorded earlier in the year.

It is another case of a surplus that has been over exploited. There is enough cotton for the world's immediate requirements but the owners are able to hold it and unwilling to sell it unless they can get what they think it is worth.

Wool continues surprisingly firm. Prices seem to advance at each successive auction sale. The woolen goods trade is waiting for its cue on the American Woolen Co.'s opening to be held this week. At the convention of the National Wholesale Dry Goods Association held in New York last week the feeling seemed cheerful and confident. There is nothing new to say about the other staples of civilization except that the merchants who handle them and the manufacturers who fabricate them seem to be cheerful and hopeful.

The Disarmament Conference is still in session at Washington but the public have ceased to be much interested in the maze of Oriental politics through which the conferees are now trying to find their way. Americans have also grown a bit weary of trying to interpret the kaleidoscopic changes in European politics that are reported from day to day. The disposition is to wait upon the economic Congress that is to be held in March at Genoa.

Pending that event international trade is marking time except as Europe is able to find the gold or sell us goods that we will take in payment for the necessaries that she must buy from us. The stock market in London is booming on easy money. Rates are down to 1 per cent on call loans and 2¾ per cent on 90-day acceptances.

The newspaper despatches indicate that there has been a distinct revival of both confidence and activity in Canada since the beginning of the year. The Province of Quebec is said to be making $4,000,000 a year out of the liquor business, now a governmental monopoly in that Province.

Gold Reserve Grows

The weekly statement of the Federal Reserve System shows a reserve ratio of 76 per cent, which is an advance of 1.3 for the week. The gold on hand has been increased by about $3,000,000. The total now amounts to $2,899,000,000, which exceeds by nearly $500,000,000 the total of Federal Reserve Notes outstanding. These figures portray a financial situation that is without precedent in the history of this or any other country.

If the plethora of lendable credit that they reflect does not soon commence to make itself felt in increased commercial and industrial activity, then we shall have to revise a theory that even the most orthodox economists have always accepted.

Briefly stated, it is that when interest rates are low and money can be easily borrowed people will borrow and buy.

The Trend of Business Improvement—Plants Resuming

The Osgood Bradley Car Co., Worcester, Mass., is arranging to increase its working force, now numbering about 600 employees, at an early date. The plant is working on a 48-hour week schedule. A recent contract placed with the company covers the construction of thirty all-steel passenger cars for the New York, Ontario & Western Railroad Co., estimated to cost about $600,000, or approximately $20,000 a car.

The Cadillac Motor Car Co., Detroit, Mich., a subsidiary of the General Motors Corporation, has resumed operations at a normal rate of production at its plant.

The Delaware, Lackawanna & Western Railroad Co. has resumed operations at its repair shops at Scranton, Pa., Kingston, Pa., and East Buffalo, N. Y., giving employment to about 3,000 men. The plants had been closed for about three weeks.

The American Radiator Co., Chicago, Ill., is operating its southern plants, including the Birmingham, Ala., works, at full capacity, with frequent overtime schedule.

Smith & Wesson, Springfield, Mass., manufacturer of revolvers and pistols, resumed operations at its plant on Jan. 16, after a shut down dating from last July. A wage reduction of 20 per cent has been made effective.

The General Motors Corporation has resumed operations at its motor truck manufacturing plant at Pontiac, Mich., following a shut down for the holidays and inventory. A production of schedule of twenty-five trucks per day has been arranged, the majority to be of the lighter models.

The Missouri-Pacific Railroad Co., St. Louis, Mo., has resumed operations at its different repair shops, including the works at Kansas City and De Soto, Mo., Hoisington, Kan., Sedalia, Mo., and Little Rock, Ark. The company has awarded a contract to T. S. Yeake & Co., 608 South Dearborn St., Chicago, Ill., for extensions in the engine house at the Hoisington plant, to cost about $12,000.

The Chandler Motor Car Co., Cleveland, Ohio, has doubled the working force at its plant recently, and plans to make further increases within the next month. The production schedule for the first quarter of the year calls for a larger output than for the same period of a year ago.

The Cumberland & Pennsylvania Railroad Co. has resumed operations at its shops at Mount Savage, Md., giving employment to about 200 men.

The West Penn Steel Co. has resumed full operations at a portion of its plant at Brackenridge, Pa. Other departments at the works are running on a part time schedule.

The General Electric Co. is operating its plant at West Lynn, Mass., on a five-day week basis at the present time, as compared with a low point of production at about 50 per cent capacity during last summer.

The Hornell Repair & Construction Co., which has been operating the repair shops of the Erie Railroad at Hornell, N. Y., for about two years past, has taken over the shops of the same railroad at Susquehanna, Pa., and will operate that plant in the future. Operations will proceed at once for contract repair work for the road.

The Fairbanks Steam Shovel Co., Marion, Ohio, is planning for the early resumption of operations at its foundry, following the installation of additional furnace equipment at the plant, now under way.

The United States Steel Corporation is arranging to convert and utilize a portion of the plant of its subsidiary organization, the Chicksaw Shipbuilding & Car Co., on the Chicksaw River, near Mobile, Ala., for railroad car construction, and has taken an order for 2,000 cars from the Seaboard Air Line Railway Co.

The Willys-Overland Co., Toledo, Ohio, is increasing the capacity of its subsidiary, the Wilson Foundry and Machine Co., Pontiac, Mich., for the production of motors for the Willys-Knight automobiles, and will inaugurate operations on the new manufacturing basis at the plant early in February. Equipment from the Elyria, Ohio, works of the company is being removed to the Pontiac plant for the enlarged production. Two of the buildings of the former Flanders automobile works at Pontiac will be used by the company for motor assembling operations. Employment will be given to additional workers at the plants.

The Western Maryland Railroad Co., Baltimore, Md., has leased its repair shops at Hillen and Port Covington, Md., to private interests, headed by C. J. Wolf, heretofore general foreman of the Baltimore terminal of the company. The change became effective on Jan. 15. The plants will continue in operation for car and locomotive repair contract work for the railroad.

Civil Engineers Convene at New York

The sixty-ninth annual meeting of the American Society of Civil Engineers was held in New York City on Jan. 18, 19 and 20. The business meetings and technical sessions were held in the Engineering Societies Building, Thirty-ninth Street. The annual reception and dinner-dance was held in the Hotel Pennsylvania on the evening of the eighteenth.

A series of excursions in and about New York gave the visiting members ample opportunity to inspect some of the biggest industrial plants and construction works in the vicinity. Among the places visited were the Stock Exchange, Federal Reserve Bank (now in process of construction), American Bank Note Co., Hell Gate Power Station and the plant of the McGraw-Hill Publishing Company.

The technical sessions covered water and rail transportation, public highways, financing and banking, public works, and administration. General discussion followed each subject.

On Wednesday morning the society conferred honorary membership on the following: Eugene Schneider, of Paris; M. Luigi Luiggi, of Rome; Samuel Rea, Ambrose Swasey and Howard A. Carson, of the United States. George A. Webster, president of the society, made the presentation addresses.

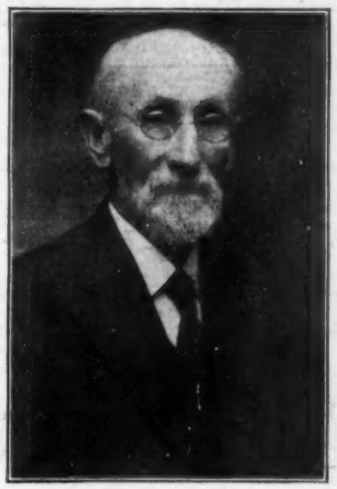
John Ripley Freeman, of Providence, R. I., was elected president for 1922. Carl Edward Grunsy, of San Francisco, and Robert Ridgeway, of New York, were elected vice-presidents.

Christopher Miner Spencer Dead at Hartford

Christopher Miner Spencer, one of the old time "Yankee" inventors and a pioneer in many of the lines that now form important units in the machinery and machine tool industries, died on Saturday Jan. 14 at the home of his son Roger Spencer, in Hartford, Conn. He was eighty-eight years old.

Mr. Spencer was born in South Manchester, Conn., June 20, 1833, a descendant of early colonial settlers. His boyhood was spent in his home town and at an early age he entered a local machine shop as an apprentice. From 1854 to 1857 he was employed at Colt's Armory in Hartford, where was developed the interest in firearms that led to the invention and patenting in 1860 of the Spencer repeating rifle which was used in the Civil War, and which Mr. Spencer personally demonstrated to President Lincoln.

In 1869 he, in company with Charles E. Billings, organized the Billings & Spencer Co., for the manufacture of drop forgings, sewing machine parts, and similar articles. He later turned his attention to screw machines and with George A. Fairfield organized the Hartford Screw Machine Co. in 1876. Both these concerns are large factors in the industrial life of Hartford at the present time. Mr. Spencer was instrumental in developing the crude and half-complete screw machine of that early period into marvelously perfect full automatic machines of the present day and, up to the time of his death, was retained in an advisory capacity by the New Britain Machine Co. in the turret machine manufacturing department.



C. M. SPENCER

The wonderful mechanical potentialities of such a machine as the automobile could hardly escape the attention of such a thoroughgoing mechanic as Mr. Spencer, and it is said that he experimented upon a steam driven wagon or buggy, and actually drove such a machine through the streets of Hartford as long ago as 1862. In later years the airplane attracted his interest. For the past two years he has been deeply engrossed in the study of the mechanical details of aircraft and, despite his advanced years, had made about twenty flights in and about Connecticut.

McCabe and Sheeran Organize Machinery Corporation

Harry McCabe, formerly vice-president and manager of the McCabe Machinery Corporation, and Frank Sheeran, formerly treasurer and sales manager of the same company, have organized the McCabe & Sheeran Machinery Corporation with offices at 149 Broadway, New York City.

This concern will act as machine tool agents in the East and will also carry a complete line of second hand machines.

Hibbard Resigns as Commissioner

The executive committee of the National Metal Trades Association has accepted the resignation of John D. Hibbard as commissioner of the organization. Mr. Hibbard has held this position since December, 1912.

Mr. Hibbard has been succeeded by Homer D. Sayre, who has been secretary of the association since 1907, and the secretaryship has been filled by Louis M. Fischer.

The headquarters of the association are in Chicago.

Gov. Hartness Better

The many friends of Governor James Hartness, of Vermont, (president of the Jones & Lamson Machine Co., Springfield, Vt.) will be pleased to hear that he has passed the crisis and is reported to be out of danger. The Governor has been seriously ill with pneumonia.

Taft-Pierce Officials in Reorganized Fraser Co.

Five former officials of the Taft-Pierce Manufacturing Co., of Woonsocket, R. I., have severed their connections with that concern and have become stockholders in the reorganized Warren F. Fraser Co., of Westboro, Mass., which was incorporated in 1914, to manufacture cylindrical grinding machinery. The men are Sydney Player, Joseph N. Bethel, Richard S. Staples, Herbert S. Indge and Alfred Box.

The executives of the reorganized company are: Warren F. Fraser, president; Frank H. McCloskey, vice-president; Sydney Player, general manager; M. J Cashmer, treasurer; R. S. Staples, assistant treasurer and metallurgist; H. S. Indge, chief engineer; A. E. Box, factory superintendent.

Buffalo Engineers in Permanent Quarters

Announcement comes from Buffalo, N. Y., that the Engineering Society of Buffalo has established a permanent headquarters in the Iroquois Hotel, in that city. Clubrooms and a meeting hall have been fitted out for the comfort of the membership, which is now reported as six hundred. A series of luncheon meetings has been very successful. On Feb. 14 the regular monthly meeting will be addressed by Prof. R. H. McKee, of Columbia University. He will speak on "Gasoline from Oil Shale."

Business Items

The Morely Machinery Corporation, of Rochester, N. Y., has purchased the plant formerly occupied by the Defiance Check Writer Corporation, at 792 St. Paul St., Rochester. The Morley concern manufactures iron planers and special machinery, and is the successor of the W. A. Wilson Machine Co. and the Rochester Boiler Works.

The property of the Mutual Truck Co., of Sullivan, Ind., which was to have been sold recently by the receiver, the National Bank of Sullivan, will be offered for sale again about the first of February. At the sale held last week the highest bidder was Sherman Osborne, of Bloomfield, who offered $9,750 for the property. The property will be readvertised for sale. The property was appraised at $124,466.21 and the liabilities are $83,401.10.

The Ansted Engine Co., recently organized at Indianapolis, Ind., to make an automobile motor invented by George Moore, of Connersville, Ind., has received an order for 30,000 motors from the Durant Motor Co. These motors will be put in the new Durrant cars.

Negotiations extending over the past nine months have culminated in the purchase by the Warren Tool and Forge Co., of Warren, Ohio., of the properties of the American Block and Manufacturing Co., and the General Malleable Co., which henceforth will be operated under the name of the Warren Forge and Tool Co. The Warren Tool and Forge Co., will continue to operate under the management which has conducted its affairs since its organization. James D. Robertson, of Pittsburgh, is president; M. J. Konold, of Warren, vice-president; George Konold, of Warren, treasurer and general manager; George F. Konold, Jr., secretary. The capitalization of the company under the purchase is $1,800,000.

Announcement was made recently by William S. Carleton and Edward E. Dean, proprietors of the Kokomo Machine Co., Kokomo, Ind., that Cleo W. Adams has been employed as general manager of the plant. Mr. Carleton and Mr. Dean recently acquired the interests of P. A. Wiley and Charles Wiley, and are now sole owners of the stock. The company reports that its business has grown rapidly in the last two years.

The Keller Foundry Co., of Knoxville, Tenn., will increase its producing capacity approximately one-third through the construction in the near future of two all-steel factory buildings, according to R. A. Keller, head of the business. The new factory will be located at East Jackson Ave. and the Southern Railway.

At a meeting held at Marietta, Ohio, last week, of directors of the Pittsburg Tin Plate and Steel Corporation, Samuel L. Black, of Columbus, was re-elected president; A. V. Somers of Marietta was named vice-president, treasurer and general manager; and O. G. Toner, secretary.

At the annual meeting of the Greenfield Tap and Die Engineering Club, in Greenfield, Mass., held on Jan. 9, C. H. Norton, of the Norton Grinding Co., gave an address on "Industrial Relations." L. M. Lamb succeeded Walter G. Carpenter as president.

The Chapman Valve Co., Springfield, Mass., opened its new steel foundry building for public inspection on Jan. 17. The machinery is electrically operated throughout.

The Rose Machine and Spring Co., formerly the Buckeye Machine and Spring Co., Canton, Ohio, has been incorporated here for $50,000. D. H. Rose, who has operated the Buckeye Machine and Spring Co. for several years, will be the head of the new concern. Other incorporators are Wendell Herbruck, F. B. Melchoir M. Sanafranek and J. Stinson. Enlargement of the plant along general lines is planned.

J. K. WILLIAMS has been elected a director of the Franz Foundry and Machine Co. at the annual meeting of the stockholders. Other officers elected were C. Franz, president; C. W. Franz, vice-president; John A. Brittian, secretary; W. H. Parry, treasurer; J. M Alderfer, R. J. Coleman and C. M. Mishler, directors.

A new 600-ton blast furnace, just completed at a cost of $5,000,000, will be put in operation this week by the Trumbull Cliffs Furnace Co. at Warren, Ohio.

The Thompson-Copeland Co. Inc., has been incorporated under the laws of Massachusetts to manufacture nuts, lock-washers, cotter pins, light stampings, screw machine products, etc. The capital stock is $50,000. The officers are: President, John T. Brierly, formerly with the Hobbs Manufacturing Co.; vice-president, Eugene A. Copeland; treasurer and manager, H. C. Thompson. The new concern has taken over the interests of the Worcester Nut Co., and will continue this line in connection with its other products. The offices are on Vine St., corner of Cherry St., Worcester, Mass.

The Harley Co., Springfield, Mass., has opened under new management with 100 men and will add to the number as becomes necessary. It is stated that negotiations are well advanced for contracts for castings and drop forgings amounting to $6,000,000, half of which will be sublet to other concerns.

The William Powell Co., Cincinnati, Ohio, manufacturer of valves, has acquired the plant of the Cincinnati Grinder Co. and will use it as a manufacturing plant to make iron and steel valves. The old plant at 2525 Spring Grove Ave., will be used to manufacture brass valves only. The new plant is located on Colerain Ave.

The Lanston Monotype Machine Co., of Philadelphia, has purchased the plant and equipment of the Barrett Adding Machine Co., of Philadelphia. The manufacture and distribution of listing and adding machines will continue under the new management.

The Seneca Iron and Steel Co., Buffalo, N. Y., reports that it is at present working on a 50 per cent production basis, having seven of its fourteen mills in operation. Officials of the company are optimistic as to the future and expect to employ many men before spring.

Personals

GEORGE R. OLSON, formerly salesman in the Middle Western States for Landers, Frary & Clark Co., New Britain, Conn., has recently joined the sales staff of Wiebusch & Hilger, Ltd., 110 Lafayette St., New York, and will cover the Middle Western States for the company, making his headquarters in the Chicago office of the firm.

P. T. IRVIN, formerly sales manager of the Lincoln Twist Drill Co., Taunton, Mass., has recently been chosen manager of the small tools division of the Greenfield Tap and Die Corporation, Greenfield, Mass.

EDMUND S. WOLFE, president of the First National Bank of Bridgeport, Conn., has recently been appointed receiver of the Coe-Stapley Manufacturing Corporation, West Haven, Conn., manufacturer of sheet metal goods, etc. Mr. Wolfe states that the present proceeding is largely for the purpose of reorganization.

P. LEROY HARWOOD, of New London, Conn., has been appointed receiver of the Groton Iron Works, Inc., Groton, Conn. The appraisers named are Archibald M. Main, of Groton, and Elias F. Morgan, of Norwich.

A. V. WILSON, who for fifteen years has been engaged in engineering construction work in the southern field, has organized the Southern Machinery and Equipment Co., in Atlanta, Ga., a new concern to handle machinery and cover the entire Southeastern territory. The company's address is Healey Bldg., Atlanta, Ga.

G. D. EAST has been appointed district sales manager for the Newton Steel Co., Youngstown, Ohio, with headquarters in Cleveland, Ohio.

FRED J. GRIFFITHS has announced his resignation as superintendent and vice-president of the Central Steel Co. of Massillon, Ohio. He has been identified with the company since 1914.

EDGAR BOURQUIN, 1347 Main St., Waltham, Mass., has recently arranged to act as distributor in the East for the Ames lettering instrument made by the O. A. Olson Manufacturing Co., Ames, Iowa.

H. A. FISHER, plant engineer of the Worcester Pressed Steel Co., has taken over the duties of the chief engineer, Mr. Marcheseault, who recently resigned, and will hereafter have charge of all new development work in addition to the duties of plant maintenance.

ELIOT B. DRURY has resigned his position as chief of the research department of the Greenfield Tap and Die Corporation to become sales promotion manager for the American Wringer Co., Woonsocket, R. I.

ARTHUR H. GRAEFENHAN, formerly chief draftsman for the John Steptoe Co., is now connected in the same capacity with the Cincinnati Ball Crank Co.

W. C. STRIPE, previously engineer of the Philadelphia office of the Combustion Engineering Corporation, is now in charge of the new branch office at Pittsburgh, Pa. OTTO DE LORENZI, test engineer, has been transferred from the New York to the Chicago office of the Combustion Engineering Corporation.

CHARLES D. BLACKWELDER, mechanical engineer, formerly with the American Machine and Manufacturing Co., has recently returned to this country after several years' service in India and Ceylon on engineering work. He is now located in Greenville, S. C.

ZENO D. BARNS has been appointed manager of the Cleveland office of the Ajax Metal Co., of Philadelphia, Pa. Mr. Barns was formerly with the Westinghouse Electric and Manufacturing Co.

W. A. PATTERSON, who has been associated with the Westinghouse Electric and Manufacturing Co. for the past sixteen years, has resigned to become vice-president of the Kaestner & Hecht Co, electric elevator builders, of Chicago.

W. D. BLATZ has been appointed general sales manager of the Bridgeport Brass Co., Bridgeport, Conn. Mr. Blatz has been connected with the company for six years.

C. H. DAVIES has resigned his position as head of the sales department of the S. E. Bowser Pump and Tank Co., Chicago, Ill. He is now in charge of advertising and marketing with the Citrus Products Co., of Chicago.

ROLAND GERRY, a director in the Jones & Laughlin Steel Co., Pittsburgh, Pa., has been appointed special sales representative of the company for the United States and Canada.

WILLIAM B. TODD, vice-president of the Unior Drawn Steel Co., Beaver Falls, Pa., has been appointed manager of the cold-rolled department of the Jones & Laughlin Steel Co., Pittsburgh, Pa.

WILLIAM N. MCMUNN, formerly with the Whiteman & Barnes Manufacturing Co., Chicago, Ill., is now with the Parish & Bingham Corporation, Cleveland, Ohio.

JOHN M. MURPHY, of the J. H. Murphy Iron Works, was re-elected president of the New Orleans Metal Trades Association, at its annual meeting held recently. C. F. Rantz was elected vice-president, and Warren Johnson secretary-treasurer.

W. C. STARKEY, who has been chief engineer of the Ohio Brass Co., for a number of years, has become vice-president and directing engineer of the Stevenson Gear Co., Indianapolis, Ind. Mr. Starkey is prominent in engineering circles and an expert on tool equipment and gear cutting devices.

W. W. CLARK, export manager of the Hart-Parr Co., tractor manufacturers, is now in Australia where the company has established a business in the past two years. Before returning to the United States Mr. Clark will spend sometime in the Philippine Islands on Hart-Parr business.

R. W. FUNK, superintendent of the Titan Metal Co. since the erection of the plant here six years ago, has resigned.

Obituary

GEORGE BALDWIN SELDEN, who has been called the "Father of the Automobile," died at his home in Rochester, N. Y., on Jan. 17. He was a graduate of Yale University, studied law under his father, and in 1871 became a practicing lawyer. From childhood, however, his mind had turned toward mechanical inventions and while studying law he began experimenting with various devices for automotive vehicles. An engine supplied with kerosene and nitrous oxide gas proved a failure, but his next scheme was triumphant. This consisted of an engine of the compression type, with gasoline for fuel. In 1879 he applied for letters patent thereon. In 1900 he began the suit against the Ford Motor Co., the Panhard and Levasseur, and other concerns in this country and in Europe, for infringement upon his patent. The case was a long and vigorously contested one, but was finally decided against Mr. Selden. Mr. Selden was president of the Selden Motor Co. of Rochester. He retained and greatly prized his first successful gasoline engine, which was made in the shop of Frederick Michel, in Rochester.

ROBERT BAILEY, retired vice-president of the Morris & Bailey Steel Co., of Wilson Station, Pa., died at his home in Cleveland, Ohio, last week.

T. CLARK DILL, founder of the T. C. Dill Machine Co., Inc., Philadelphia, died on Jan. 6 of heart failure. Mr. Dill began as a machinist and his early experience with slotting machines led to the designing of the well-known Dill slotter with the adjustable head. Mr. Dill, although of a quiet and retiring disposition, was well known among his fellow members of the National Machine Tool Builders' Association, and his genial manner and consistent attendance will be missed at the coming conventions.

HARRY O. STACE, president of the H. O. Stace Iron Works, of New Orleans, La., died last week. He was fifty-one years old.

JAMES A. BRADY, founder and president of the James A. Brady Foundry Co., Chicago, Ill., died in that city on Jan. 9. He was seventy-four years old. Mr. Brady organized the company which bore his name in 1899, and was its president and general manager until his retirement about ten years ago.

HERMAN HEROLD, owner of the Herold Machine Works, Lima, Ohio, died in that city on Jan. 11. He was forty-eight years old.

ARTHUR SEYMOUR BROWN, vice-president of the Ansonia, Conn., branch of the American Brass Co., Waterbury, Conn., died on Jan. 11 at his home in Orange, Conn. Mr. Brown was forty-five years of age. He has been with the American Brass Co. for some time, and was also identified with other industrial concerns of Connecticut.

Forthcoming Meetings

National Association of Manufacturers: Special convention on tariff legislation, Jan. 30 and 31, New Willard Hotel, Washington, D. C. G. S. Boudinot, 50 Church St., New York City, is secretary.

American Boiler Manufacturers' Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary, 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

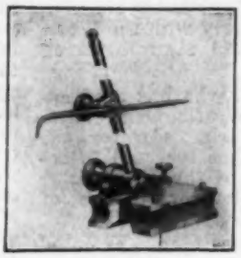
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Gage, Surface

Union Tool Co., Orange, Mass.

"American Machinist," Sept. 1, 1921

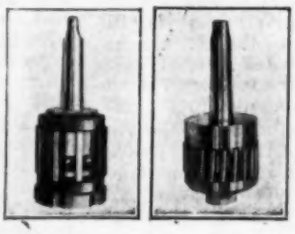


The upright or spindle may be set at any angle with the base over a radius of 270 deg., and tightened in position by means of a draw-sleeve and knurled nut. Close adjustment is provided in any of the positions by the small regulating screw at the end of the lever that carries the spindle. A V-slot in the base provides for the use of the tool in connection with round work, and a pair of push plugs in each end of the base enables the lining up of work from the top, side or bottom of a plate. Weight, 2 lb.

Reamer and Burnishing Tool, Ford Cylinder

Indiana Tool Co., Richmond, Ind.

"American Machinist," Sept. 1, 1921.

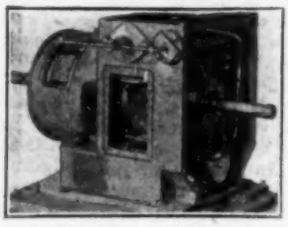


This reamer and burnishing tool are for refinishing the cylinder bores of Ford and Fordson engines. It is claimed that the use of them gives the cylinder walls a smooth, hard finish. The reamer contains ten inserted blades of high-speed steel and of length sufficient to allow for grinding. The method of holding the blades keeps them at the proper adjustment. The pilot, which is of tool steel, hardened and ground, is free to turn and guide the reamer. The burnishing tool contains twenty floating rollers, made of high carbon steel, and hardened and ground.

Control, Spindle Speed, Variable, Liquid

Oilgear Co., Milwaukee, Wis.

"American Machinist," Sept. 8, 1921.

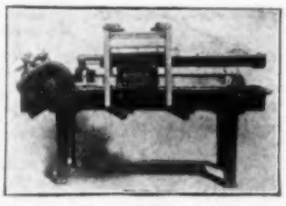


This device is intended for transmitting the power from a lineshaft or constant-speed motor to the spindle of a machine tool, giving any speed desired between the limits. The drive is through liquid pressure, both a pump unit and a motor unit connected hydraulically being provided. By varying the stroke of the pump, the speed of the hydraulic motor and of the spindle can be readily varied. An automatic overloading gear is provided to reduce the speed, also by reducing the stroke, when the lathe is taking too heavy a cut. The thrusts of the plungers are taken on roller bearings, and no connecting rods are used.

Lockseaming Machine, Automatic

Stolp Co., Geneva, N. Y.

"American Machinist," Sept. 8, 1921.

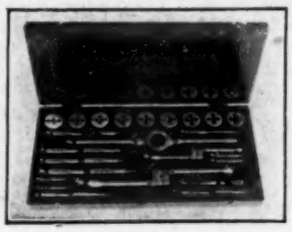


The machine produces lock-seamed articles direct from the blank without an extra operation, and it is also equipped with a self-feeding attachment, by which lock-seamed tubes can be produced direct from a coil of metal. It will lock-seam tubes of any thickness of metal, and taper tubes within certain limits. The machine can be used for the manufacture of such articles as tin cans, mailing tubes and muffler tubes.

Screw-Plate Sets

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Sept. 1, 1921.

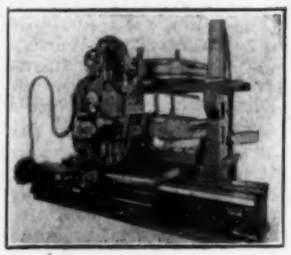


The taps and dies included in these sets are some of the regular product of the company. The various sets include from five to nine sizes of taps, either taper or plug or both, with corresponding dies. Either U. S., S. A. E., or Whitworth Standard threads can be furnished. The sets containing five or seven sizes of taps and dies include one tap wrench and one die stock, while the sets of nine sizes contain two tap wrenches and two die stocks. Each set is packed in a case, together with a screwdriver.

Die-Sinking Machine, Automatic

Keller Mechanical Engraving Co., Brooklyn, N. Y.

"American Machinist," Sept. 8, 1921.

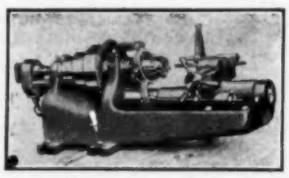


The machine can be operated either automatically or semi-automatically, reproducing in iron or steel the master form, which can be made of wood or plaster. Very light pressure is applied by the tracer on the master, although a heavy pressure can be applied to the cutting tool. The machine is electrically operated, and hand wheels are not provided. By means of push buttons, all the movements, feeds and rapid traverses can be controlled. The machine is adapted to making dies for drop-forging work, as well as for sheet-metal forming.

Threading Machine, Bench

Geometric Tool Co., New Haven, Conn.

"American Machinist," Sept. 8, 1921.

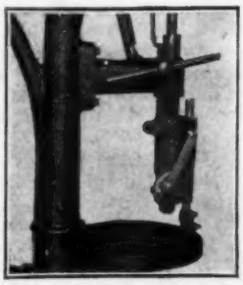


The machine is fitted with a self-opening rotary die head to cut threads of fine pitch on diameters from $\frac{1}{4}$ to $\frac{1}{2}$ in. The bed of the machine consists of a single casting, and carries a spindle mounted on bronze bearings and driven by a three-step cone pulley. Adjustable stops, arranged on the trip rod, govern the point of opening and closing the die head. The carriage is equipped with a two-jawed chuck, operated by a handwheel, and it travels on a round shaft. The machine is arranged for bolting to a bench, or it may be mounted on a separate pedestal.

Filing Attachment, Drill Press

Utility Tool and Manufacturing Co.,
2717 Lafayette Ave., St. Louis, Mo.

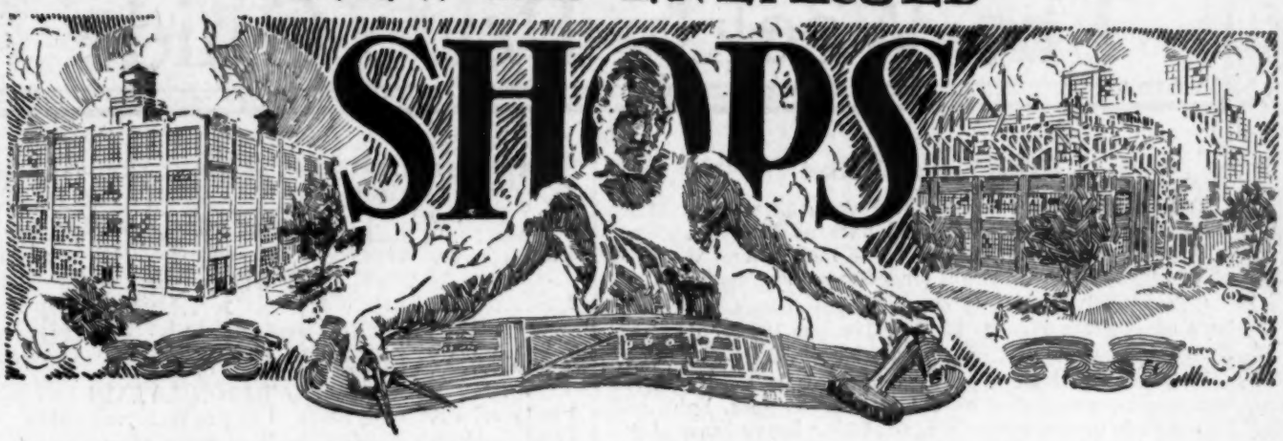
"American Machinist," Sept. 8, 1921.



This filing attachment is intended for application to drilling machines. It consists of a housing which slips on the spindle sleeve, and which contains a pair of bevel gears operated by the machine spindle. To one of the gears is attached a crank that serves to reciprocate a shaft, the lower end of which carries a file. The attachment will accommodate files up to 16 in. in length. The ram is adjustable for any angle up to 90 deg. with the spindle.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Cal., Los Angeles—The Atchison, Topeka & Santa Fe Ry., Kerckhoff Bldg.—traveling crane extending length of proposed machine shop, 65 x 510 ft., at San Bernardino.

Conn., Danbury—R. M. Beers, 51 Main St.—one ton chain hoist for automobile repair work.

Conn., Seymour—F. Holbrook, Derby Ave. one small grinder for farm work.

Ill., Chicago—The Chicago Machine Tool Co., 645 West Washington Blvd.—one 26 in. Libby turret lathe, late type.

Ill., Chicago—A. B. Segur & Co., 728 West Madison St.—one punch press, 14 in. back opening clutch on sliding ways.

Ill., Chicago—F. P. Smith Wire & Iron Wks., 2346 Clybourn Ave., A. McClure, Purch. Agt.—one power press 14 or 16 ft. long also a 43 ft. span crane about 5 ton, motor height.

Ill., Chicago—The Quick Service Radiator Repair Co., 2341 Cottage Grove Ave., B. Wade, Purch. Agt.—one ¼ in. electric drill, tinner's tools, one small power hammer and machinery for making radiator cores.

Ill., Chicago—J. A. Toff, 1228 Winnimac Ave.—one lathe and one drill press.

Ill., Chicago—W. E. Williams, 28 East Jackson Blvd.—one 20 in. crank shaper.

Ill., Streator—The Streator Community High School Dist., R. C. Osborn, 202 East Main St., Pres.—manual training equipment for proposed Community High School.

Ill., Sycamore — The Chicago Insulated Wire & Mfg. Co.—one surface grinder, capacity to swing up to 24 in. in diameter (used).

Ill., Virden—The Bd. Educ., F. H. Shriver, Secy. — manual training and domestic science equipment.

Ill., Waukegan—J. S. Heath Co., J. S. Heath, Jr., Purch. Agt.—one Smurr & Kauren No. 2 automatic wire crimping, cutting and counting machine.

Md., Cumberland—The Cumberland Sales & Service Station, Virginia Ave. and 5th St.—machine shop equipment for repair and service departments of proposed sales station.

Mass., Lowell — The Lamson Co., 196 Walker St., manufacturer of carrier tubes, steel conveyors, etc.—one double end punch, with capacity ¾ in. hole through ¾ in. plate, 36 in. gap on one end and 12 in. gap on the other, also one double angle shear, capacity 6 in. x 6 in. x ¾ in., for plant at Eastwood, N. Y.

Mich., Detroit—The Grennan Cake Corp., 1230 17th St.—equipment for bakery, including machinery for mixing dough and handling cakes.

Mich., Detroit—The Grosse Pointe Motor Service Garage, 16701 Jefferson Ave.—automobile service station machinery.

Mich., Detroit—Lamb Co., 1938 Franklin St.—No. 60 Heald internal grinders, also cylinder reboring tools.

Mo., Hannibal—C. Miner, 313 Main St., will receive bids until Feb. 15, equipment for general shop and radiator repair shop, including cornice brake, bender and automobile radiator core, boring machine, etc.

Mo., Joplin—The Spotless Cleaners & Dyers, 106 Main St.—cleaning machinery.

Mo., Webb City—The Rock Hill Paint & Cloth Co., R. Porter, Secy.—paint making machinery, rock grinders and pulverizers.

N. J., Newark—The Wigder Mfg. Co., 28 Wickliffe St.—one automatic drop hammer, 600 or 800 lb. (used if in good condition).

N. Y., Buffalo—H. Schumacker, c/o E. S. Williams, 59 Highgate Pk. — small foot power lathe.

N. Y., Buffalo—One 12 ft. machine for corrugating flat and galvanized steel sheets with forms for 2½ in. and 1¼ in. standard corrugations. Address W. F. Schweigert, Secy. of the Niagara Machine & Tool Wks., 637-697 Northland Ave.

N. Y., Buffalo—J. M. Sparks Wholesale Dairy, 146 Prospect Ave., J. M. Sparks, Purch. Agt.—metal turner and bench folder for repairing milk cans.

N. Y., New York—The Janusch Mfg. Co., 282 East 135th St.—four speed lathes, two turret lathes and one screw press.

N. Y., New York—Kays Inc., 204 East 107th St.—one bench lathe and one milling machine.

N. Y., New York—The Natl. Biscuit Co., 10th Ave. and 15th St.—equipment for proposed factory and warehouse at Cincinnati, O.

N. Y., New York—The Progressive Die Cutting Co., 204 Greene St.—three shears, 45 in. long.

N. Y., Rochester—The Bd. Educ.—equipment for foundry, automobile and sheet metal shop, in connection with proposed high school on Hudson and Norton Sts.

N. C., Wilmington—Carter's Production Wks., 210 South Water St., O. Carter, Mgr. —one automatic saw sharpener for single saws.

O., Ada—The McCurdy Mfg. Co., S. M. McCurdy, Purch. Agt.—metal working machinery of all kinds.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., H. C. Jones, Purch. Agt.—one double crank geared press, similar to Bliss, No. 2½, 35 to 40 ton pressure.
One 1,000 ampere plating dynamo, 8 to 12 volts.
One belt driven 200 lb. drop hammer.
One No. 60 Heald cylinder grinder.

O., Cincinnati — W. Powell Co., 2525 Spring Grove Ave., R. McFarlan, Purch. Agt.—equipment for the manufacture of iron and steel valves.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave.—two 12 in. woodworking speed lathes, motor driven, with 55 in. beds and two with 72 in. beds, also one 20 in. pattern maker's lathe, motor driven.

O., Cleveland—The city, J. F. Maline, Dir. of Pub. Serv.—one direct heat rotary dryer.

Ore., Portland—The Treasury Dept., J. A. Wetmore, Superv. Archt., Wash., D. C., will receive bids until Feb. 10, for the installation complete of mail conveying machinery in the United States Post Office, here.

Pa., Dormont — The Bd. Educ. — shop equipment including lathes for vocational department of high school now under construction.

Pa., Johnstown—The Benshoff Printing Co., 1110 Franklin St., H. M. Benshoff, Prop.—linotype machine, presses, etc.

Pa., Phila.—The Boice Folding Box Co., Ogden and Hallon St. W. S. Boice 4020 Spruce St., Pres.—automatic folding and cutting machines, also general equipment for paper box manufacturing.

Pa., Phila.—L. F. Seyfert's Sons, Inc., 437-41 North 3rd St., L. J. Hay, Purch. Agt.—several 24-36 and 42 in. Bullard New Era type vertical boring mills.

Pa., Phila.—The Tasty Baking Co., 2335 Sedgley St.—automatic mixers, automatic formers, conveyors, electric furnaces, etc.

Pa., Pittsburgh—Hubbard & Co., 6301 Butler St., manufacturer of shovels—two 12 ft. rotary annealing furnaces with conveyors.

Pa., Pittsburgh—The Pittsburgh & West Virginia R.R., Wabash Bldg.—one 42 in. car wheel borer.

Pa., Sharpsburg—J. E. Klug, 205 8th St. —small woodworking lathe or speed lathe (used if in good condition).

Pa., Washington—G. Kestrick, 988 Bruce St.—metal working machinery including lathe, drill press and shaper (used if in good condition).

Tenn., Camden—R. R. Melton—machinery and materials for the manufacture of patent auto license plates.

Va., Richmond — Hackley Morrison Co., 16½ North 9th St.—one punch, 24 in. architectural jaws with motor, ¾ in. or 1 in. capacity.
One punch, 12 in. architectural jaws with motor, ½ in. capacity.
Two riveting hammers, capacity ¾ in. rivets.
One chipping hammer, Little David, or equivalent.
One rivet forge, oil, portable, compressed air blaze, 300 rivets per hour.
One portable electric drill, capacity, ½ in. holes.
Bridge reamers, drills, rivet sets, ¼ in. to 1 in.
One grinder, motor or belt type, 2-12 in. x 2 in. wheels, heavy work.
One bolt and pipe threading machine, capacity to 1¼ in. bolts and 2 in. pipe.
One pipe bending machine to take up to 2 in. pipe, hand operated.
One power hack saw, capacity 6 x 6 or 8 x 8, high speed.
Four span geared hoists, capacity 2 ton, Yale preferred.
Hand threading stocks and dies, ¾ in. to 1¼ in.
One 16 or 20 in. crank shaper.
Eight compound rests for 19 in. LeBlond lathes.
One No. 3 or No. 4 stone crusher.
One No. 5 Champion portable crusher with screen and elevator.
One 25 to 40 ton standard gage, saddle tank locomotive.
One 4 in. sand pump.
One 6 in. sand pump.
One 10 to 15 ton complete raw water ice plant.
One 20 ton wagon scale.
One No. 5 or No. 6 Roots or Connorsville positive blower.
Advise as to shipping points.

Va., Wytheville—R. P. Johnson, O. M. Johnson, Purch. Agt.—one 6 or 8 in. x 24 or 30 in. heavy planer and matcher; must be modern, good fast feed (used).
One 10 to 20 ton ice plant, complete with boiler.
One ½ yd. clamshell bucket, Hayward preferred.
One set of 12 x 12 in. derrick irons and sheaves, complete, for wood beam derrick.

The Weekly Price Guide

This Week's Market

Tank plates are quoted at the Pittsburgh mills at $1.50; structural shapes and soft steel bars at $1.50@$1.60 per 100 lb. Heavy tonnages seem to be maintaining the $1.50 price very firmly with slight tendency to move toward $1.60.

Chicago mill quotations on structural shapes, plates and bars range from $1.60 to $1.70 or 10c. per 100 lb. above the Pittsburgh base.

Reductions in dealers' purchasing prices, at the New York warehouses, are quoted on old metals. Copper, light, and bottoms are quoted at 9c. as against 9½c.; heavy brass at 6c., reduced from 7c., and light brass at 4½c., as compared with 5c. per lb. one week ago.

Copper and zinc show considerable dullness in the New York warehouses, with tin quiet and lead fairly steady.

Linseed oil is quoted in New York at 75c. as against 73c. per gal. in 5-bbl. lots.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	20.76
Virginia No. 2	28.74
Basic	20.75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel **butt welded.**	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel **lap welded.**	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.50		12@13
1/8	7.15		11@12
5/32 to 1/4	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			33.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 5.10; New York			5.50
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.65	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.25
Babbitt metal (best grade)	33.00	42.50	36.00
Babbitt metal (commercial)	16.00	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.50	11.00
Copper, heavy, and wire	11.00	11.00	10.00
Copper, light, and bottoms	9.00	9.00	8.75
Lead, heavy	4.00	3.75	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.00	6.50	6.50
Brass, light	4.50	4.50	5.00
No. 1 yellow brass turnings	5.75	5.50	5.75
Zinc	3.00	2.50	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.75	.76	.79
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$2.75
Coke, prompt foundry, Connellsville	per net ton		3.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60%	60-10-10%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Carriage bolts, up to 1 in. x 30 in.	50-10%	50-10-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$5.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.75	3.50
Washers, round plate, per 100 lb. Off list	4.00	.....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	3.50	3.43
Cone heads, ditto (net)	3.60	3.60	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60-5%	40-10%	50-10%
Copper burs	40%	15%	10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50-5%	50-5%	60-10%
Medium grade	45%	40-10-2½%	50%
Heavy grade	40%	40%	40-5%
Rubber and duck:			
First grade	50-10%	50-10%	.....
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$6.16	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	29.48	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.20	.....	3.20

Wis., Belgium—Allen-Spiegel Shoe Mfg. Co.—modern shoe making machinery, electric power.

Wis., Cudahy—L. Joslin, 724 Layton Ave.—drilling machine, boring mill and drill press.

Wis., Eau Claire—Eau Claire County, G. Osborne, Purch. Agt.—machinery including lathe, drills, presses, etc., for machine shop now under construction.

Wis., Fond-du-Lac — The Combination Door Co., 180 Ruggles St., L. C. Schmidt, Pres.—several sanders, mortisers, planers, and special woodworking machinery.

Wis., Hurley—The Raineri & Norman Motor Co.—gasoline storage tanks, pumps and air compressor.

Wis., LaCrosse—Starch Bros. Co., Front and Pearl Sts.—auto cylinder grinder.

Wis., Madison—Feldman Paper Box Co., 515 Regent St., I. Feldman, Purch. Agt.—folding machine and printing machine, motor power.

Wis., Milwaukee — The Fenske Tire & Radiator Wks., 2709 Grand Ave.—vulcanizing machine and air compressor.

Wis., Milwaukee—Filer & Stowell Co., 219 Becher St., J. Monaghan, Purch. Agt.—one cupola and forge for foundry.

Wis., Milwaukee—The International Harvester Co., 217 Oregon St.—gasoline storage tank and pump.

Wis., Milwaukee—Jensen & Lindemann, 1105 11th St. (manufacturers of sheet metal), A. Jensen, Purch. Agt.—one punch press.

Wis., Milwaukee—Marks Bros. Dye Wks., 1107 Wells St.—vats, etc., for proposed dye works on North Ave.

Wis., Milwaukee—The Phoenix Knitting Co., 208 Bway.—special dye work machinery.

Wis., Milwaukee — O. Rathmann, 912 23rd Ave. (stone cutter)—one 5 ton crane.

Wis., Milwaukee — O. C. Resech, 1284 North Pierce St.—one lathe, one drill press and one grinder for auto repair work.

Wis., Milwaukee—C. Utech, 906 11th St. (manufacturers of screens and sash)—one shaper about 4 ft.

Wis., Monroe—P. A. Ruf Co.—mechanical baking equipment, including mixers, etc., motor power.

Wis., Rhinelander—Rhinelander Box & Lumber Co.—woodmaking machinery and nailing machine.

Wis., Sheboygan — Verhulst Bros. Co., Erie Ave.—special woodworking machinery for proposed plant on Calumet St.

Wis., Sheboygan—The Wisconsin Hotel Co., A. N. Merritt, Pres., Hotel Foeste—two 10 hp. ice machines, laundry equipment including two washing machines, mangiers, etc.

Wis., Stevens Point—R. E. Newby, 119 Strongs Ave.—auto repair shop equipment, presses, etc.

Wis., Sturgeon Bay—The Sturgeon Bay Fruit Co.—special machinery for proposed canning factory.

Wis., West Allis—The Kroening Constr. Co., 68th and Greenfield Aves., R. Kroening, Purch. Agt.—woodworking lathe.

Ont., Dresden — The Dresden Machine Shop & Garage—equipment for machine shop and auto repair shop.

Ont., Kingsville—The Canadian Tobacco Growers' Co.—equipment, tanks, cutters and special machinery for the manufacture of fertilizers for tobacco growers.

Ont., Listowel — A. Malcolm Furniture Co.—equipment for machine shops, small metal working tools, drills and lathes.

Ont., St. Marys — Divinneys Garage—equipment for garage and auto repair shop.

Metal Working Shops

Cal., San Bernardino — The Atchison, Topeka & Santa Fe Ry., Kerckhoff Bldg., Los Angeles, is receiving bids for the construction of a 1 story, 65 x 510 ft. machine shop, here. Estimated cost, $300,000. Private plans.

Conn., Hartford — J. Reibert, Mountain Rd., West Hartford, is having plans prepared for the construction of a 1 story, 52 x 220 ft. garage and repair shop on Park St. Estimated cost, $52,000. G. H. Matthews, 48 Campfield Ave., Archt.

Conn., Southington—Peck, Stow & Wilcox Co., Railroad Sq., is receiving new bids for the construction of a 1 story, 67 x 180 ft. hardening shop, a 2 story, 56 x 156 ft. grinding building, and a 1 story, 59 x 100 ft. addition to forge shop. Estimated cost, $225,000. Private plans.

Conn., Stratford (Bridgeport P. O.)—Hollander Bros., 360 George St., are having plans prepared for the construction of a 3 story, 55 x 104 ft. factory on Seymour St., for the manufacture of metal goods. Estimated cost, $50,000. Davis & Dane, 1024 Main St., Bridgeport, Archts.

Conn., Wallingford — Lockwood Greene & Co., Archts. and Engrs., 101 Park Ave., New York City, are receiving bids for the construction of a 5 story, 80 x 100 ft. hardware factory on Cherry St., for H. L. Judd & Co., 43 South Cherry St. Estimated cost, $100,000. Noted Aug. 25.

Ind., Evansville—The Evansville Structural Supply Co., 215 1st Ave., is having plans prepared for the construction of a 1 story, 100 x 200 ft., fabricating plant on Division and Kerth Aves. Estimated cost, $40,000. Private plans.

Kan., Wichita—W. P. Innes, 112 North Lawrence Ave., is having plans prepared for the construction of a 1 story, 85 x 147 ft. garage. Estimated cost, $50,000. E. Forsblom, 405 Sedgwick Bldg., Archt.

Md., Baltimore — J. Lample, 15 North Fremont Ave., is having plans prepared for the construciton of a 1 story, 60 x 65 ft. garage on North Fremont Ave. Estimated cost, $75,000. J. R. Forsythe, 232 St. Paul St., Archt.

Md., Cumberland—The Cumberland Sales & Service Station is having plans prepared for the construction of a 100 x 150 ft. sales and service station on Virginia Ave. and 5th St. Estimated cost, $100,000. T. W. Biddle, Jr., Cumberland, Archt.

Mich., Escanaba—The Wolverine Delta Motor Co. will open bids about Feb. 1 for the construction of a 1 or 2 story, 100 x 140 ft. garage. Estimated cost, $60,000. Hubert & Nelson, Menominee, Archts.

Mo., St. Louis—The Audrey Realty Co., 614 Chestnut St., is having plans prepared for the construction of a 1 story, 100 x 125 ft. garage. Estimated cost, $45,000. Wedemeyer & Nelson, Wainwright Bldg., Archts.

Mo., St. Louis—G. G. Hoffman Magneto Co., 3932 Olive St., has awarded the contract for the construction of a 1 story, 100 x 234 ft. salesroom, garage and service station at 3872 Washington St. Estimated cost, $50,000. S. G. Hoffman, Pres. Noted Jan. 19.

N. Y., New York—I. Langner, c/o J. DeHart, Archt. and Engr., 1041 Fox St., will build a 2 story, 35 x 50 ft. garage on 185th St. and Bway. Estimated cost, $90,000.

N. Y., New York—The Tunnel Garage, 2 Charlton St., plans to build a 100 x 120 ft. garage on Broome and Thompson Sts. Estimated cost, $75,000. G. L. Stevers, Pres. Private plans.

N. Y., Rochester—The Bd. Educ. has had preliminary plans prepared for the construction of a 3 story, 346 x 450 ft. and 100 x 100 ft. high school, including a machine shop, auto shop and foundry, on Hudson and Norton Sts. Estimated cost, $4,000,000. E. S. Gordon, 125 Sibley Bldg., Archt.

O., Cleveland—The Mueller Electric Co., 2143 Fairmount Rd., has had plans prepared for the construction of a 1 and 2 story, 63 x 94 ft. factory and garage on East 31st St., near Payne Ave. Estimated cost, $50,000. G. S. Rider & Co., Century Bldg., Archts.

Pa., Oil City—The Oil Well Supply Co., is building a 60 x 170 ft. steel foundry.

Pa., Phila.—J. Feldman, Lincoln Bldg., will receive bids until Feb. 1 for the construction of a 1 story, 60 x 120 ft. garage at 119 Wildey St. Estimated cost, $40,000. I. W. Levine, Liberty Bldg., Archt.

Pa., Pittsburgh—The Standard Sanitary Mfg. Co., Preble Ave., has awarded the contract for the construction of a 1 story, 117 x 130 ft. plating plant.

Pa., Pittsburgh—The Westinghouse Electric & Mfg. C., East Pittsburgh, will soon award the contract for the construction of a 4 story, 100 x 200 ft. manufacturing and storage building on Lang and Susquehanna Aves., here. B. H. Prack, Keystone Bldg., Archt.

Pa., Royersford—The Royersford Needle Wks. has awarded the contract for the construction of a 2 story, 50 x 150 ft. and 24 x 32 ft. needle factory. Estimated cost, $20,000.

Pa., Sharon—The Wilton Tool Co., 2123 Grand Ann Ave., Detroit, Mich., is having plans prepared for the construction of two 1 story factories, one 50 x 200 ft. and other 20 x 100 ft. Hydraulic Steel Craft Co., Illinois Bldg., Cleveland, O., Engrs.

Wis., Hurley — The Raineri & Norman Motor Co. is having plans prepared for the construction of a 1 and 2 story, 50 x 140 ft. garage on 3rd Ave. Estimated cost, $50,000. Private plans. Noted Jan. 19.

Wis., Milwaukee—The International Harvester Co., 217 Oregon St., is receiving bids for the construction of a 1 story, 50 x 100 ft. garage on Reed St. Estimated cost, $40,000. Private plans.

Wis., Sheboygan—J. Hamacheck & Sons, Two Rivers, are having plans prepared for the construction of a 1 story, 40 x 50 ft. garage on 9th St., here. Estimated cost, $50,000. Address E. A. Juul, Imig. Bldg., Sheboygan, Archt. and Engr.

Wis., Stevens Point — R. E. Newby, 119 Strongs Ave., purchased a site on Main St. and plans to build a 1 story, 71 x 125 ft. garage. Estimated cost, $40,000. Architect not selected.

Ont., Welland—The Welland Machine & Fdry Co. plans to build an addition to its plant. L. R. Weeks Eng. Co., Erie, Pa., Engrs.

General Manufacturing

Cal., Eureka—The Bd. of Supervisors of Humboldt County will soon receive bids for the construction of a heating and laundry plant addition to its Tubercular Hospital.

Cal., Marysville — The Virden Packing Co. 1300 Bryant St., San Francisco, has awarded the contract for the construction of a packing plant on J St. from 5th to 9th Sts., here. Estimated cost, $250,000.

Conn., Hamden (New Haven P. O.)—A. W. Flint Co., 407 Winthrop Ave., plans to build a 1 story, 50 x 200 ft. factory on Dixwell Ave., for the manufacture of ladders, etc. Architect not selected.

N. J., Bloomfield—The Amer. Book Co., Washington Sq., New York, has had plans prepared for the construction of a 1 story book plant, here. Estimated cost, $150,000. Austin Co., 217 Bway., New York, Archts. and Engrs. Noted Jan. 6.

O., Cincinnati — The Natl. Biscuit Co., 10th Ave. and 15th St., New York, and 401-07 Lock St., Cincinnati, is having plans prepared for the construction of a 7 story, 140 x 463 ft. factory and warehouse at 617 Hunt St., here. Estimated cost, $2,500,000 Private plans.

O., Cleveland—The Leatherkraft Co., c/o J. J. Metcalf, 1255 West 4th St., plans to build a 2 story, 60 x 100 ft. commercial building and factory at 5914 Cedar Ave. Estimated cost, $50,000. Architect's name withheld.

Pa., Johnstown—The Benshoff Printing Co., 1110 Franklin St., plans to build a 3 story, 90 x 100 ft. printing plant on Franklin St., to replace one destroyed by fire. Estimated cost, $150,000. H. M. Benshoff, Prop. Architect not selected.

Pa., Phila.—C. E. Wunder, Archt., 1415 Locust St., will receive bids until Feb. 15 for the construction of a 2 story twine factory on Delaware Ave. and Dickenson St., for the Morrice Twine Mills, 84 Tasker St.

Wash., Tacoma—The Tacoma Ice & Refrigerating Co., South 26th and Adams Sts., plans to build a 5 story cold storage plant, (400,000 cu.ft. capacity) and ice plant (output, 100 ton every 24 hours). Estimated cost, $250,000.

Wis., Fond-du-Lac — The Combination Door Co., 180 Ruggles St., has awarded the contract for the construction of a 2 story, 50 x 90 ft. door factory. Estimated cost, $60,000. L. Schmidt, Pres.

Wis., Oconomowoc—The Hurtgen Dairy Co. has awarded the contract for the construction of a 2 story, 30 x 104 ft. dairy. Etimated cost, $25,000.

Wis., Plymouth—The Badger Cabinet Co. plans to build a 2 story, 60 x 135 ft. chair factory. Estimated cost, $50,000. Architect not selected.

Wis., Racine—Bondgard & Christensen, 2222 Kinzie Ave., is having plans prepared for the construction of a 4 story, 150 x 150 ft. plant on Mound St., for the manufacture of wood products. Estimated cost, $50,000. A. A. Guilbert, Robinson Bldg., Archt.

Wis., Spencer—The Spencer Condensary Co., c/o E. Buss, Marion, plans to build a 2 story, 45 x 110 ft. dairy on Main St. here. Estimated cost, $75,000. Architect not selected.